# Cost of Capital

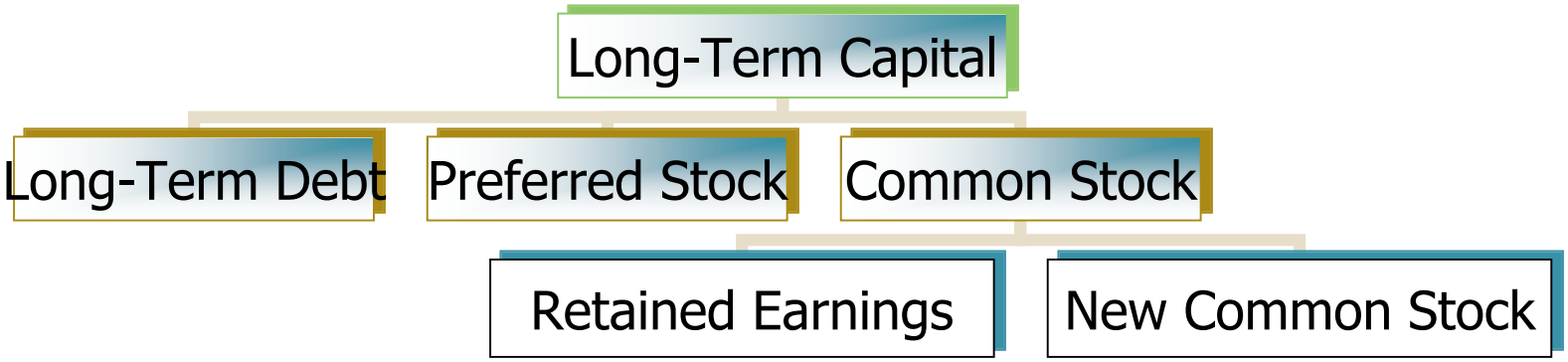
# Lesson Outline

- The Cost of Capital
- The Cost of Equity
- The Costs of Debt and Preferred Stock
- The Weighted Average Cost of Capital

# Why Cost of Capital Is Important

- The return to an investor (and creditor) is the same as the cost to the company
- Our cost of capital provides us with an indication of how the market views *the risk of our assets*
- Knowing our cost of capital can also help us determine our required return for *capital budgeting projects*

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



# Calculating the weighted average cost of capital

$$WACC = w_d k_d (1-T) + w_p k_p + w_s k_s$$

- The w's refer to the firm's capital structure weights. The weights are determined by how much of each type of financing we use
- The k's refer to the cost of each component.

# Should our analysis focus on before-tax or after-tax capital costs?

- Stockholders focus on A-T CFs. Therefore, we should focus on A-T capital costs
- We are concerned with after-tax cash flows, so we need to consider the effect of taxes on the various costs of capital
- Interest expense reduces our tax liability
  - This reduction in taxes reduces our cost of debt
  - After-tax cost of debt = $R_D(1-T_C)$
- Dividends are not tax deductible, so there is no tax impact on the cost of equity

# Should our analysis focus on historical (embedded) costs or new (marginal) costs?

- The cost of capital is used primarily to make decisions that involve raising new capital. So, focus on today's marginal costs (for WACC).

# How are the weights determined?

$$WACC = w_d k_d(1-T) + w_p k_p + w_s k_s$$

- Use accounting numbers or market value (book vs. market weights)?
- Use actual numbers or target capital structure?

# Example: Capital Structure Weights

- Suppose you have a market value of equity equal to $500 million and a market value of debt = $475 million.
  - What are the capital structure weights?
    - V = 500 million + 475 million = 975 million
    - $w_s$ = E/V = 500 / 975 = .5128 = 51.28%
    - $w_D$ = D/V = 475 / 975 = .4872 = 48.72%

# Cost of Debt

- The cost of debt is the required return on our company's debt
- We usually focus on the cost of long-term debt or bonds
- The required return is best estimated by computing the yield-to-maturity on the existing debt or using CAPM
- The cost of debt is NOT the coupon rate

# Using YTM

- YTM is the IRR an investor earns holding the bond to maturity, receiving all promised payments
- If there is little risk of default, we can use the bond's yield to estimate investors' expected return (cost of debt)
- If the risk of default is significant, the yield will overstate investors' expected return

# Adjusting YTM for default risk

- Consider a one-year bond with YTM of y. For each $1 invested in the bond today, the issuer promises to pay $(1+y) in one year.
- Default probability p, in which case bondholders receive only $(1+y-L), where L is the expected loss per $1 of debt
- The expected return of bond:

$$r_d = (1-p)y + p(y-L) = y - pL = \text{Yield} - \text{Prob(default)} \times \text{Expected Loss Rate}$$

- The need to adjust depends on bond's riskiness

# Example: Adjusting YTM

Table 1

| Rating: | AAA | AA | A | BBB | BB | B | CCC | CC-C |
|---|---|---|---|---|---|---|---|---|
| **Default Rate:** | | | | | | | | |
| Average | 0.0% | 0.0% | 0.2% | 0.4% | 2.1% | 5.2% | 9.9% | 12.9% |
| In Recessions | 0.0% | 1.0% | 3.0% | 3.0% | 8.0% | 16.0% | 43.0% | 79.0% |

*Source*: "Corporate Defaults and Recovery Rates, 1920–2008," *Moody's Global Credit Policy*, February 2009.

- Historically, the average loss rate for unsecured debt is 60%.
- So, the expected return to B-rated bondholders during average times is 3.1% (0.052x0.6) below the bond's quoted yield

# Important Notes

- A bond's expected return, which is equal to the firm's debt cost of capital, will be less than the yield to maturity if there is a risk of default
- A higher yield to maturity does not necessarily imply that a bond's expected return is higher.

# Using CAPM

- In principle, we can use CAPM to estimate cost of debt
- But, debt betas are difficult to estimate as corporate bonds are infrequently traded
- One approximation is to use estimates of bond indices by rating category

Table 2

| **By Rating** | *A and above* | *BBB* | *BB* | *B* | *CCC* |
|---|---|---|---|---|---|
| Avg. Beta | < 0.05 | 0.10 | 0.17 | 0.26 | 0.31 |
| **By Maturity** | (BBB and above) | *1–5 Year* | *5–10 Year* | *10–15 Year* | *> 15 Year* |
| Avg. Beta | | 0.01 | 0.06 | 0.07 | 0.14 |

*Source*: S. Schaefer and I. Strebulaev, "Risk in Capital Structure Arbitrage," Stanford GSB working paper, 2009.

# Example 1

- In mid-2009, homebuilder KB Home had outstanding 6-year bonds with a yield to maturity of 8.5% and a BB rating. If corresponding risk-free rates were 3%, and the market risk premium is 5%, estimate the expected return of KB Home's debt.

# Example 1: Using YTM

- Given the low rating of debt, as well as the recessionary economic conditions at the time, we know the yield to maturity of KB Home's debt is likely to signicantly overstate its expected return. Using the recession estimates from the Table 1 and an expected loss rate of 60%, we have

$$r_d = 8.5\% - 8\% \times 0.6 = 3.7\%$$

# Example 1: Using CAPM

- Alternatively, we can estimate the bond's expected return using the CAPM and an estimated beta of 0.17 from the Table 2. So, $r_d = 3\% + 0.17 \times 5\% = 3.85\%$
- While both estimates are rough approximations, they both confirm that the expected return of KB Home's debt is well below its promised yield.

# Component cost of debt

- Interest is tax deductible, so

$$A\text{-}T\ k_d = B\text{-}T\ k_d\ (1\text{-}T)$$

$$= 3.85\%\ (1 - 0.40) = 2.31\%$$

- Use nominal rate.
- Flotation costs are small, so ignore them.

# Quick Quiz

- How do you compute cost of debt and after-tax cost of debt?
- Is yield to maturity a reliable measure of cost of debt?
- Is coupon rate an appropriate measure of cost of debt?

# Component cost of preferred stock

$$WACC = w_d k_d(1-T) + w_p k_p + w_c k_s$$

- $k_p$ is the marginal cost of preferred stock.
- The rate of return investors require on the firm's preferred stock.

# Cost of Preferred Stock

- Reminders
  - Preferred stock generally pays a constant dividend each period
  - Dividends are expected to be paid every period forever
- Preferred stock is a perpetuity, so we take the perpetuity formula, rearrange and solve for $K_P$

# Example 1: What is the cost of preferred stock?

- Your company has preferred stock that has an annual dividend of $3. If the current price is $25, what is the cost of preferred stock?
- $K_P = 3 / 25 = 12\%$

# Example 2: What is the cost of preferred stock?

Your company has preferred stock that has an annual dividend of $10. If the current price is $111.10, what is the cost of preferred stock?

$$k_p = D_p / P_p$$
$$= \$10 / \$111.10$$
$$= 9\%$$

# Component cost of preferred stock

- Preferred dividends are not tax-deductible, so no tax adjustments necessary. Just use $k_p$.
- Nominal $k_p$ is used.
- Our calculation ignores possible flotation costs.

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

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

# Component cost of equity

$$WACC = w_d k_d(1-T) + w_p k_p + w_c k_s$$

- $k_s$ is the marginal cost of common equity using retained earnings (using new equity).
- The rate of return investors require on the firm's common equity using new equity is $k_e$.

# Cost of equity

- Using retained earnings: $k_s$
- Issuing new common stock to raise capital: $k_{s(SEO)}$

# Why is there a cost for retained earnings?

- Earnings can be reinvested or paid out as dividends.
- Investors could buy other securities, earn a return.
- If earnings are retained, there is an opportunity cost (the return that stockholders could earn on alternative investments of equal risk).
  - Investors could buy similar stocks and earn $k_s$.
  - Firm could repurchase its own stock and earn $k_s$.
  - Therefore, $k_s$ is the cost of retained earnings.

# Two ways to determine the cost of common equity, $k_s$

- **The Dividend Growth Model**

  DGM: $k_s = (D_1 / P_0) + g$

- **Capital Asset Pricing Model**

  $k_s = k_{RF} + (k_M - k_{RF})\ \beta$

# The Dividend Growth Model Approach

- Start with the dividend growth model formula and rearrange to solve for $R_E$

$$P_0 = \frac{D_1}{K_s - g}$$

$$K_s = \frac{D_1}{P_0} + g$$

# Dividend Growth Model Example

- Suppose that your company is expected to pay a dividend of $1.50 per share next year. There has been a steady growth in dividends of 5.1% per year and the market expects that to continue. The current price is $25. What is the cost of equity?

$$K_s = \frac{1.50}{25} + .051 = .111 = 11.1\%$$

# Dividend Growth Model Example

- If $D_0$ = \$4.19, $P_0$ = \$50, and g = 5%, what's the cost of common equity based upon the DGM approach?

$D_1 = D_0 (1+g)$
$D_1 = \$4.19 (1 + .05)$
$D_1 = \$4.3995$

$k_s = D_1 / P_0 + g$
$= \$4.3995 / \$50 + 0.05$
$= 13.8\%$

# Example: Estimating the Dividend Growth Rate (g)

**What is the expected future growth rate?**

1. Use ROE and Payout ratio

The firm has been earning 15% on equity (ROE = 15%) and retaining 35% of its earnings (dividend payout = 65%). This situation is expected to continue.

$$g = (1 - \text{Payout})(\text{ROE})$$
$$= (0.35)(15\%)$$
$$= 5.25\%$$

# Example: Estimating the Dividend Growth Rate (g)

2. Use the historical average

| Year | Dividend | Percent Change |
|---|---|---|
| 2000 | 1.23 | - |
| 2001 | 1.30 | (1.30 – 1.23) / 1.23 = 5.7% |
| 2002 | 1.36 | (1.36 – 1.30) / 1.30 = 4.6% |
| 2003 | 1.43 | (1.43 – 1.36) / 1.36 = 5.1% |
| 2004 | 1.50 | (1.50 – 1.43) / 1.43 = 4.9% |

Average = (5.7 + 4.6 + 5.1 + 4.9) / 4 = 5.1%

# Advantages and Disadvantages of Dividend Growth Model

- Advantage – easy to understand and use
- Disadvantages
  - Only applicable to companies currently paying dividends
  - Not applicable if dividends aren't growing at a reasonably constant rate
  - Extremely sensitive to the estimated growth rate – an increase in g of 1% increases the cost of equity by 1%
  - ***Does not explicitly consider risk***

# The SML (CAPM) Approach

- Use the following information to compute our cost of equity
  - Risk-free rate, $K_{rf}$
  - Market risk premium, $E(K_M) - K_{rf}$
  - Systematic risk of asset, $\beta$

$$K_s = K_{rf} + \beta_E (E(K_M) - K_{rf})$$

# Example - SML

- Suppose your company has an equity beta of .58 and the current risk-free rate is 6.1%. If the expected market risk premium is 8.6%, what is your cost of equity capital?
  - $K_s = 6.1 + .58(8.6) = 11.1\%$
- Since we came up with similar numbers using both the dividend growth model and the SML approach, we should feel pretty good about our estimate

# Advantages and Disadvantages of SML

- Advantages
  - Explicitly adjusts for systematic risk
  - Applicable to all companies, as long as we can estimate beta
- Disadvantages
  - Have to estimate the *expected* market risk premium, which does vary over time
  - Have to estimate beta, which also varies over time
  - We are using the past to predict the future, which is not always reliable

# Another Example – Cost of Equity

- Suppose our company has a beta of 1.5. The market risk premium is expected to be 9% and the current risk-free rate is 6%. We have used analysts' estimates to determine that the market believes our dividends will grow at 6% per year and our last dividend was $2. Our stock is currently selling for $15.65. What is our cost of equity?
  - Using SML: Ks = 6% + 1.5(9%) = 19.5%
  - Using DGM: Ks = [2(1.06) / 15.65] + .06 = 19.55%

# What (if) company raises capital by issuing new common stock?

- Calculate Cost of equity using DGM
- When a company issues new common stock they also have to pay flotation costs to the underwriter.
- Flotation costs depend on the risk of the firm and the type of capital being raised.

$$k_{s(SEO)} = \frac{D_1}{P_0(1-F)} + g$$

# Quick Quiz

- What are the two approaches for computing the cost of equity?
- How do you compute the capital structure weights required for the WACC?
- What is the WACC?
- Rank the following: cost of debt, cost of preferred stock, cost of equity, cost of equity (seasoned equity offering)

# Estimating the Cost of Equity

| | Capital Asset Pricing Model | Constant Dividend Growth Model |
|---|---|---|
| **Inputs** | Equity beta | Current stock price |
| | Risk-free rate | Expected dividend next year |
| | Market risk premium | Future dividend growth rate |
| **Major Assumptions** | Estimated beta is correct | Dividend estimate is correct |
| | Market risk premium is accurate | Growth rate matches market expectations |
| | CAPM is the correct model | Future dividend growth is constant |

# Divisional and Project Costs of Capital

- Using the WACC as our discount rate is only appropriate for projects that have the same risk as the firm's current operations
- If we are looking at a project that does NOT have the same risk as the firm, then we need to determine the appropriate discount rate for that project
- Divisions also often require separate discount rates

# Using WACC for All Projects - Example

- What would happen if we use the WACC for all projects regardless of risk?
- Assume the WACC = 15%

| Project | Required Return | IRR |
|---|---|---|
| A | 20% | 17% |
| B | 15% | 18% |
| C | 10% | 12% |

# The Pure Play Approach

- Find one or more companies that specialize in the product or service that we are considering
- Compute and un-lever the beta for each company
- Take an average
- Use that beta along with the CAPM to find the appropriate return for a project of that risk
- Often difficult to find pure play companies

# Un-levering Beta

- From beta's perspective,

$$\beta_A = \beta_U = \frac{E}{E+D}\beta_E + \frac{D}{E+D}\beta_D$$

- The systematic risk of equity equals business risk plus financial risk

$$\beta_E = \beta_U + D/E(\beta_U - \beta_D)$$

# Example: Pure Play Approach

- US Department Stores:

| Ticker | Equity Beta | D/V | Debt Rating | Debt Beta | Asset Beta |
|---|---|---|---|---|---|
| DDS | 2.38 | 0.59 | B | 0.26 | 1.13 |
| JCP | 1.60 | 0.17 | BB | 0.17 | 1.36 |
| KSS | 1.37 | 0.08 | BBB | 0.10 | 1.27 |
| M | 2.16 | 0.62 | BB | 0.17 | 0.93 |
| JWN | 1.94 | 0.35 | BBB | 0.10 | 1.30 |
| SKS | 1.85 | 0.50 | CCC | 0.31 | 1.08 |
| SHLD | 1.36 | 0.23 | BB | 0.17 | 1.09 |
| | | | | Average | 1.16 |
| | | | | Median | 1.13 |

$$\beta_U = \left(\frac{E}{E+D}\right)\beta_E + \left(\frac{D}{E+D}\right)\beta_D = (1-0.59)\times 2.38 + 0.59 \times 0.26 = 1.13$$

# Subjective Approach

- Consider the project's risk relative to the firm overall
- If the project is more risky than the firm, use a discount rate greater than the WACC
- If the project is less risky than the firm, use a discount rate less than the WACC
- You may still accept projects that you shouldn't and reject projects you should accept, but your error rate should be lower than not considering differential risk at all

# Subjective Approach - Example

| Risk Level | Discount Rate |
|---|---|
| Very Low Risk | WACC – 8% |
| Low Risk | WACC – 3% |
| Same Risk as Firm | WACC |
| High Risk | WACC + 5% |
| Very High Risk | WACC + 10% |

# In-Class Exercise: Calculate WACC

**Equity**

- 50 million shares
- $80 per share
- Beta = 1.15
- Market risk premium = 9%
- Risk-free rate = 5%

**Debt**

- $1 billion in outstanding debt (face value)
- Current quote = 110
- Coupon rate = 9%, semiannual coupons
- 15 years to maturity
- Tax rate = 40%

**Preferred Stock**

- 10 million shares
- $25 per share
- Annual dividend = $ 3

# Calculate WACC (con't)

- **What is the cost of debt?**
  - N = 30; PV = -1100; PMT = 45; FV = 1000; CPT I/Y = 3.9268
  - Kd = 3.927(2) = 7.854%
- **What is the after-tax cost of debt?**
  - $Kd(1-T_C) = 7.854(1-.4) = 4.712\%$
- **What is the cost of equity?**
  - Ks = 5 + 1.15(9) = 15.35%
- **What is the cost of preferred stock?**
  - Kp = 3 / 25 = 12 %

# Calculate WACC (con't)

- What are the capital structure weights?
  - E = 50 million (80) = 4 billion
  - D = 1 billion (1.10) = 1.1 billion
  - P = 10 million (25) = 250 million
  - V = 4 + 1.1 + 0.25 = 5.35 billion
  - $w_s$ = E/V = 4 / 5.35 = .7477
  - $w_D$ = D/V = 1.1 / 5.35 = .2056
  - $w_p$ = D/V = 0.25 / 5.35 = .0467

# Calculate WACC (con't)

$$\mathbf{WACC = w_d k_d(1\text{-}T) + w_p k_p + w_s k_s}$$

WACC = 0.2056(4.712%)
+ 0.0467(12.00%)
+ 0.7477(15.35%)

= **13.01%**

# Lesson Summary

- The cost of equity (common and preferred stocks)
  - Dividend Growth Model
  - CAPM
- The cost of debt
  - YTM (and adjustment for default risk)
  - CAPM
  - Bond Pricing Theorem (for private bonds)
- WACC
  - Overall required return for the overall firm. Appropriate discount rate for cash flows similar in risk to those of the overall firm.

# End of Lesson