Lecture 8
The Cost of Capital

- Introduction
- Cost of Capital Components
  - Common Stock
  - Debt
  - Preferred Stock
- Estimating Component Weights
- Weighted Average of Capital (WACC)

Introduction

What determines a firm's value?

- A firm's intrinsic value is the sum of all the future *expected* **free cash flows** converted into today's dollars:

$$Value = \frac{FCF_1}{(1+WACC)^1} + \frac{FCF_2}{(1+WACC)^2} + ... + \frac{FCF_\infty}{(1+WACC)^\infty}$$

FCF = Free Cash Flow
WACC = the Weighted Average Cost of Capital

Introduction

- Free cash flows are the cash flows generated from the firm's investments
  - that are "free" (i.e. available) for distribution to all investors (creditors and stockholders)
  - after paying current expenses, taxes, and making the investments necessary for growth.
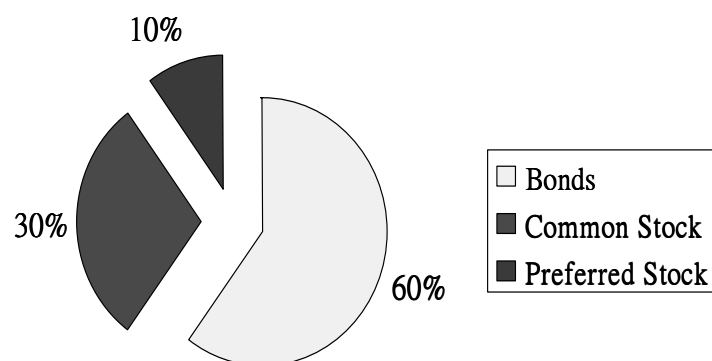
Introduction

- The discount rate is the weighted average cost of capital (WACC).
  - "Cost of Capital" because the discount rate should reflect the *required rate of return* of the company's investors.
  - The "weighted average" because most companies use different types of capital to finance its investments.
- The weighted average cost of capital (WACC) is the *average rate of return required* by the company's investors.

Introduction

- A company raises capital from investors through issuing debts (bonds) and equity (stocks) to finance its investments.
- There are two main types of capital:
  - Debts:
    - Bonds
  - Equity:
    - Common Stocks and
    - Preferred Stocks

Introduction

Capital Structure Example

Introduction

■ The company's creditors and shareholders expect to be compensated for the funds they invested in that company.

■ The **required rate of return** on each capital component is called its *component cost.*

- The *required return* of the <u>creditors</u> is the firm's **cost of debt**.

- The *required return* of the <u>shareholders</u> is the firm's **cost of equity**.

■ There are two *types* of capital but three *components*: debts, preferred stocks, and common stock.

The Cost of Capital of a Firm

■ Since free cash flows are available to all providers of capital, a firm's cost of capital must be a weighted average of all sources of capital.

■ In other words, the overall cost of capital of a firm is the weighted average of the cost of the various components: the cost of debt and the cost of equity.

■ The Weighted Average Cost of Capital (WACC) is the interest rate a firm should use to discount expected cash flows of its investments.

WACC

■ Three basic capital components are: debts (d), common stocks (s), and preferred stocks (ps).

■ The Weighted Average Cost of Capital is

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

where w_d, w_s, and w_{ps} are the component weights.

■ The WACC is used to determine if certain investments or projects are worth undertaking.

Estimating WACC

■ We will first discuss how to estimate the cost of each of the three capital components:

● Common stocks

● Debts

● Preferred stocks

■ Then we will discuss how to estimate the component weights.

■ Since the WACC is used to discount future cash flows, their estimations must be *forward-looking*.

The Cost of Common Stocks (r_s)

Three ways to determine r_s

1. CAPM: the SML approach

   (most widely used)

2. DDM: the Discounted Cash Flow (DCF) approach

3. Own-Bond-Yield-Plus-Risk-Premium:
   $$r_s = r_d + RP.$$

   (Usually used for privately held companies)

CAPM: The SML Approach

■ According to the CAPM, the required return on a risky asset / security depends on

- the risk-free rate: r_{RF}
- the systematic risk of the security relative to the market: β
- the market risk premium: $r_M - r_{RF}$

and is given by the SML

$$r_s = r_{RF} + \beta(r_M - r_{RF}) \ .$$

Example: The SML Approach

Suppose r_{RF} = 7%, MRP = 6%, β = 1.2.

$$r_s = r_{RF} + \beta(r_M - r_{RF})$$

$$= 7.0\% + 1.2\ (6.0\%)$$

$$= 14.2\%.$$

Comments on r_{RF}

■ The risk-free rate is supposed to be the return on a security or a portfolio of assets that has no default risk and uncorrelated with the returns of other assets.

■ In practice, we can use either short-term (e.g. 90-day) T-Bills or long-term (10-yr or 20-yr) T-Bonds.

■ The point: match the firm's investment horizon with the maturity of the government security.

Comments on β

- Estimates of a company's beta are provided by companies like Bloomberg and Value Line, and are publicly available information.

- β is typically obtained using historical returns. But cost of capital is a forward-looking concept, so we should use the estimate of a company's *expected* beta if available.

DDM: The DCF Approach

- The dividend discount model (DDM) is more suitable for mature, stable-grow companies with constant or predictable growth rates of dividends.

- Can still be used for companies with non-constant growth, but computations will be complicated.

- Cannot be used for companies that pay no dividends or with unstable revenue and earning growth rates.

DDM: The DCF Approach

■ Assuming that the firm's dividend will grow at a constant rate g, the price of a share of stock is

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

■ Rearrange terms to obtain

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

Estimating the Growth Rate g

■ To use the DDM approach, we need to come up with an estimate of g.

■ One way to estimate g is to use the Earning Retention Method:

$$g = b(\text{ROE})$$

where b = Retention Ratio (the % of profit <u>not</u> being paid out as dividend)
ROE = Return on Equity

Earning Retention Method

- Suppose the company has been
  - earning 15% on equity (= ROE)
  - retaining 35% (= b)

  and this situation is expected to continue.
- Retention growth rate:

  $g = b(\text{ROE}) = 0.35 \times 15\% = 5.25\%$.

Example: The DCF Approach

Given: $D_0 = \$4.19$, $P_0 = \$50$, $g = 5.25\%$.

$$r_s = \frac{D_1}{P_0} + g = \frac{D_0(1+g)}{P_0} + g$$

$$= \frac{\$4.19(1.0525)}{\$50} + 0.0525$$

$$= 0.0882 + 0.0525$$

$$= 14.07\%$$

Own-bond-yield-plus-risk-premium Approach

■ A subjective (ad hoc) procedure to estimate a firm's cost of equity based on its observable cost of long-term debt.

■ Logic: Firms with higher risk, and therefore low-rated, high interest rate debts will also have riskier, higher-cost equity.

r_s = Firm's Own Bond yield + risk premium

■ Note: The risk premium is a subjective estimate (and $\neq$ MRP in CAPM).

Example: own-bond-yield-plus-risk-premium approach

■ Suppose the bonds of a firm have a yield of r_d = 10% and it's risk premium is estimated to be RP = 4%

■ Its estimated cost of equity is therefore

$$r_s = r_d + RP$$
$$= 10.0\% + 4.0\%$$
$$= 14.0\%$$

What is a reasonable final estimate of $r_{s?}$

| Method	Estimate
DDM	13.8%
CAPM	14.2%
r_d + RP	14.0%
Average	14.0%

Judgment is needed – use the estimate most "reasonable" under the circumstances.

The Cost of Debt (r_d)

■ The cost of debt is simply the interest rate a firm must pay on **new** borrowing.

■ This rate can be observed directly or indirectly.

● If the firm already has bonds outstanding, the YTM on those bonds is the market required rate of return on the firm's debt.

● If the firm's bonds are rated, we can simply look up the interest rate on newly issued bonds of the same rating.

Example: The Cost of Debt

The firm has 15-year, 12% semi-annual bonds outstanding that sells for $1,153.72. What is r_d?

0		1		2		30
$r_d = ?$					...	
-1,153.72		60		60		60 + 1,000
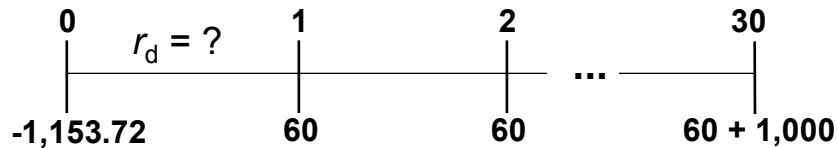
INPUTS	30		-1153.72	60	1000
	N	I/YR	PV	PMT	FV
OUTPUT		5.0% x 2 = r_d = 10%			

Component Cost of Debt

■ r_d is the required rate of return on debts.

■ But interest payments on debts are tax deductible, so we need to take the firm's tax rate into account.

■ Let T = 0.4 be the firm's marginal tax rate, so the after tax (AT) cost of debt is

$$r_{d\,AT} = r_{d\,BT}(1 - T)$$
$$= 10\%(1 - 0.40) = 6\%.$$

BT = before tax

The Cost of Preferred Stock (r_{ps})

■ Recall that preferred stocks pay a fixed dividend every period forever, so a share of preferred stock is essentially a perpetuity.
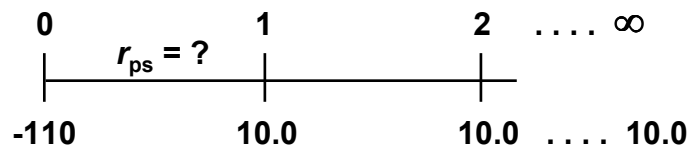
■ The price of a share of preferred stock is

$$P_{ps} = D_{ps} / r_{ps}$$

So the cost of preferred stock is simply

$$r_{ps} = D_{ps} / P_{ps}$$

Example: The Cost of Preferred Stock

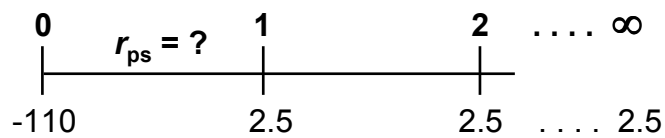Consider a share of preferred stock with a par of $100, pays 10% dividend, and sells for $110.

0		1		2	. . . .	∞
	r_{ps} = ?					
-110		10.0		10.0	. . . .	10.0

Example: The Cost of Preferred Stock

The cost of preferred stock is:

$$r_{ps} = \frac{D_{ps}}{P_{ps}} = \frac{0.1(\$100)}{\$110}$$

$$= \frac{\$10}{\$110} = 0.0909$$

$$= 9.09\%.$$

Cost of Preferred Stock:
Quarterly dividend

```
   0              1              2   . . . . ∞
   |  r_ps = ?    |              |
   |              |              |
 -110           2.5            2.5  . . . . 2.5
```

$$P_{ps} = \frac{D_Q}{r_{Per}}$$

$$r_{Per} = \frac{\$2.50}{\$110} = 2.272\%;$$

$$\$110 = \frac{\$2.50}{r_{Per}}.$$

$$r_{ps(Nom)} = 2.272\%(4)$$

$$= 9.09\%.$$

Estimating Weights for the WACC

- The "weights" are the percentage of each capital component that the firm will be financed with.
- If possible, always use the target weights of the firm's capital budget.
- If you don't know the target weights, estimate the component weights using current market value of each component.

(More...)

Estimating Weights: An Example

- Suppose a firm has
  - 3 million shares of common stocks outstanding and stock price is $50 a share,
  - $25 million of preferred stock, and
  - $75 million of debt.

(More...)

■ Market value of each capital component

V_s = $150 million (= $50 x 3 million).

V_{ps} = $25 million.

V_d = $75 million.

■ Total <u>market</u> value

$150 + $25 + $75 = $250 million.

■ w_s = $150/$250 = 0.6

w_{ps} = $25/$250 = 0.1

w_d = $75/$250 = 0.3

What is the firm's WACC?

The component costs we have found above:

$r_d(1 - T) = 6\%$, $r_{ps} = 9.09\%$, $r_s = 14\%$

So the Weighted Average Cost of Capital of the firm is

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

= 0.3(10%)(0.6) + 0.1(9.09%) + 0.6(14%)

= 1.8% + 0.909% + 8.4%

= 11.109%.

Key Points to Keep in Mind

1. Remember that capital components are sources of funding that come from investors. If the funding is not from an investor, it is <u>not</u> a capital component.

   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, however, adjust for these items when calculating the cash flows of projects, but not when calculating the WACC.

Key Points to Keep in Mind

2. Should we focus on historical ("embedded") costs or new ("marginal") costs?

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

(More ...)

Key Points to Keep in Mind

a. When estimating the cost of debt, <u>don't</u> use the coupon rate on existing debt.

Use the <u>current</u> interest rate on new debt or YTM of outstanding bonds because they are the relevant pre-tax cost of debt.

b. When estimating the MRP ($r_M - r_{RF}$) using the CAPM approach, don't use *historical* average return on common stocks as r_M.

Use the <u>current</u> expected future return on common stocks (current r_M) and the current long-term T-bond rate as r_{RF}.

Key Points to Keep in Mind

3. Don't use use book values to estimate the capital structure weights for the WACC.

Use the firm's **target** capital structure to determine the weights.

If you (as an outside analyst) don't know the target weights, it is better to use the <u>current market values</u> of equity instead of the book values.

Flotation Costs

- Flotation costs (*F*) are commissions and fees associated with <u>new</u> debt or equity issues.
- Flotation costs are usually a percentage of the value of the issue, and the rate depends on the risk of the firm and the type of capital being raised.
- Flotation costs are usually fairly low for debt issues, but can be as high as 15% for equity.

Estimate the cost of <u>new</u> Common Equity $P_0 = {}^\$50$, $D_0 = {}^\$4.19$, $g = 5\%$, and $F = 15\%$.

The cost of common stock is:

$$r_s = \frac{D_0(1+g)}{\boxed{P_0(1-F)}} + g$$

$$= \frac{\$4.19(1.05)}{\$50(1-0.15)} + 0.05$$

$$= \frac{\$4.40}{\$42.50} + 0.05$$

$$= 15.4\%$$

Estimate the cost of <u>new</u> Preferred Stock
P_s = $110, D = 10%, Par = $100 and F = 5%.

The cost of preferred stock is:

$$r_{ps} = \frac{D_{ps}}{P_{ps}(1-F)} = \frac{0.1\,(\$100)}{\$110(1-0.05)}$$

$$= \frac{\$10}{\$104.5} = 0.0957 = 9.57\%.$$

Adjusting WACC for Flotation Costs

Adjusting for Flotation Costs
$r_d(1 - T) = 6\%$, $r_{ps} = 9.57\%$, $r_s = 15.4\%$

So the Weighted Average Cost of Capital of the firm is

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

= 0.3(10%)(0.6) + 0.1(9.57%) + 0.6(15.4%)

= 1.8% + 0.957% + 9.24%

= 11.997%.

What factors influence a company's WACC?

- Market conditions, especially interest rates and tax rates.
- The firm's capital structure and dividend policy.
- The firm's investment policy – firms with riskier projects generally have a higher WACC.

WACC Estimates for Some Large U. S. Corporations

Company	WACC	w_d
Intel (INTC)	16.0	2.0%
Dell Computer (DELL)	12.5	9.1%
BellSouth (BLS)	10.3	39.8%
Wal-Mart (WMT)	8.8	33.3%
Walt Disney (DIS)	8.7	35.5%
Coca-Cola (KO)	6.9	33.8%
H.J. Heinz (HNZ)	6.5	74.9%
Georgia-Pacific (GP)	5.9	69.9%

Historical WACC
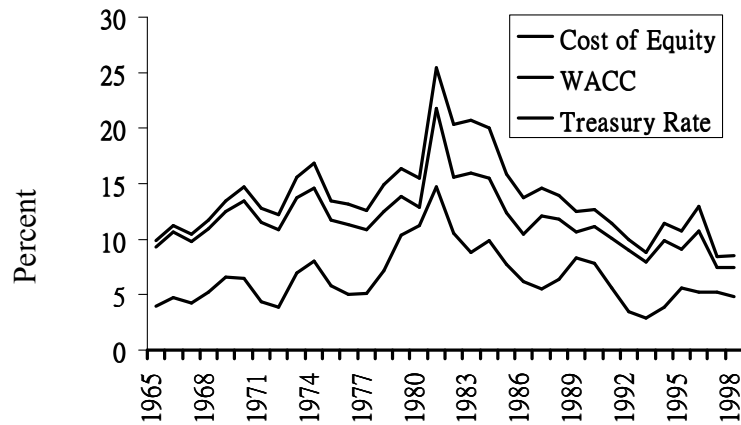
Exercise

- The target capital structure of Rollins Corporation is 20 percent debt, 20 percent preferred stock, and 60 percent common equity.
- Its bonds have a 12 percent coupon, paid semi-annually, a current maturity of 20 years, and sell for $1,000.
- The firm could sell, at par, $100 preferred stock which pays a 12 percent annual dividend, but flotation costs of 5 percent would be incurred.

Exercise

- Rollins' beta is 1.2, the risk-free rate is 10 percent, and the market risk premium is 5 percent. Rollins just paid a dividend of $2.00 on its common stock which sells for $27.00 per share. It is a constant-growth firm with a dividend growth rate of 8 percent.
- The firm uses a risk premium of 4 percentage points when using the bond-yield-plus-risk-premium method to find r_s.
- The marginal tax rate of the firm is 40 percent.

Q1: What is the firm's cost of debt?

- Information:
  - Coupon rate = 12%, bonds selling at par
  - Since Rollins' bond is selling at par, their YTM = coupon rate.
- Cost of debt (before tax)

  $r_d = 0.12$

Q2: What is the firm's cost of preferred stocks?

- Information on new preferred stock issue:
  - Par = $100
  - 12% annual dividend
  - Flotation cost = 5% of amount issued
- Cost of preferred stocks

  r_{ps} = 0.12(100) / 100(1-0.05)

  = 0.126

Q3: What is the firm's cost of common stocks?

- Information:
  - β = 1.2, r_{RF} = 10%, MRP = 5%
  - D_0 = $2.0, P_0 = $27, g = 8%
- Using CAPM

  r_s = 0.1 + 1.2(0.05) = 0.16
- Using DDM

  r_s = 2(1+0.08)/27 + 0.08 = 0.16
- Using Own-bond-yield plus risk premium

  r_s = 0.12 + 0.04 = 0.16

Q4: What is the firm's WACC?

- Information:
  - Target capital structure

    $w_d = 0.2$, $w_{ps} = 0.2$, $w_s = 0.6$
  - Capital component costs
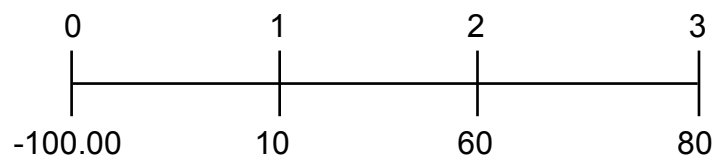
    $r_d = 0.12$, $r_{ps} = 0.126$, $r_s = 0.16$
  - Marginal tax rate = 0.4 (40%)
- Weighted Average Cost of Capital

  WACC = 0.2(0.12)(1-0.4) + 0.2(0.126) + 0.6(0.16)

         = 0.1356

Using WACC

- Consider the following investment which requires an initial outlay of $^\$100$ (a negative cash flow) and expects to generate positive cash flows in the three subsequent periods.

| 0	1	2	3
-100.00	10	60	80

- Is this investment worth undertaking?

Using NPV Rule

■ Yes, IF the investment is profitable. That is, if it can yield a positive rate of return.

■ An investment is profitable if its **Net Present Value** is positive

NPV = PV of inflows – PV of outflows > 0

■ Question: What discount rate should the firm use to determine the PV of the cash flows?

■ Answer: The WACC

Using WACC

The NPV of the investment if r_d = 13.56%

0		1	2	3
	13.56%			
-100.00		10	60	80

8.806

46.526

54.628

$9.96 = NPV
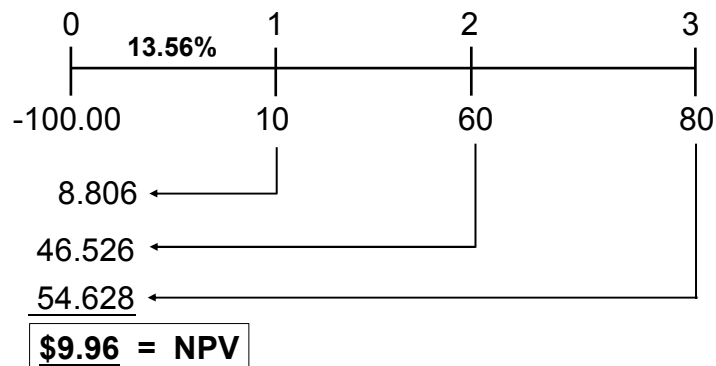
Cost of Capital & Required Return

■ Since the WACC of this firm is 13.56% the appropriate discount rate for project evaluation is r_d = 13.56%.

■ That means the firm must earn a rate of return of <u>at least</u> 13.56% on its investments in order to compensate its investors for the use of capital to finance the project.

■ In this example the investment is profitable because its NPV > 0.