



SPROTT

SCHOOL OF BUSINESS

BUSI 2504i - Essentials of Business Finance

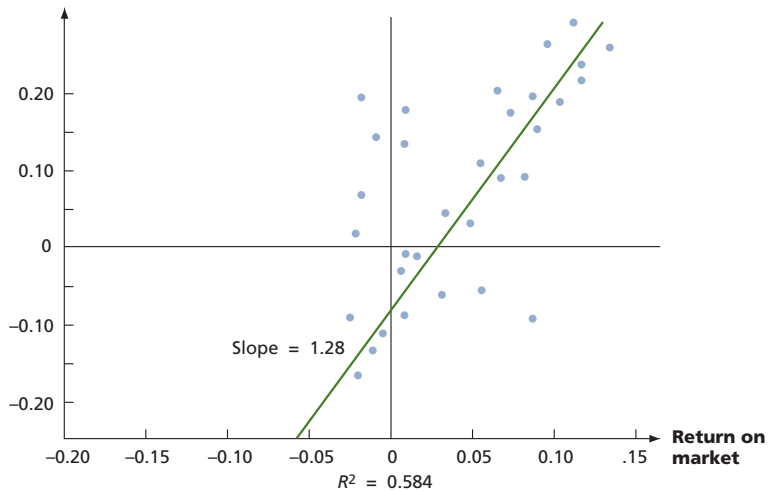
Wednesday, March 10, 2010

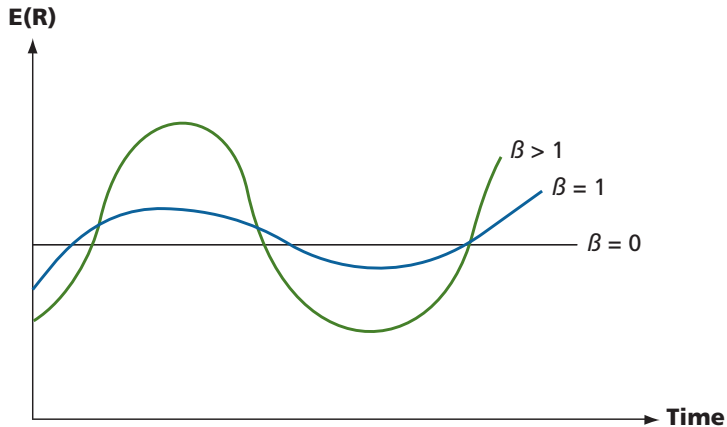
§14 cost of capital

- marked midterms
- **final exam** - april 9, 2010,
09:00-12:00, location tba
- **daily show interview** -
“the quants”

- How do we measure systematic risk?
 - We use the beta coefficient (β) to measure systematic risk
- What does beta tell us?
 - $\beta = 1$ - the asset has the same systematic risk as the overall market
 - $\beta < 1$ - the asset has less systematic risk than the overall market
 - $\beta > 1$ - the asset has more systematic risk than the overall market

Return on company





- The capital asset pricing model defines the relationship between risk and return

CAPM

$$\underbrace{E(R_{asset})}_{\text{expected return}} = \underbrace{R_f}_{\text{risk-free rate}} + \beta_{asset} \underbrace{(E(R_{market}) - R_f)}_{\text{risk premium}}$$

- If we know an asset's systematic risk, we can use the CAPM to determine its expected return
- This is true whether we are talking about financial assets or physical assets

The stock of Martin Industries has a beta of 1.43. The risk-free rate of return is 3.6% and the market risk premium is 9%. What is the expected rate of return on Martin Industries stock?

answer: 16.5%

- §14.1 - Cost of Capital: Preliminaries
- §14.2 - Cost of Equity
- §14.3 - Costs of Debt and Preferred Stock
- §14.4 - Weighted Average Cost of Capital
- §14.6 - Flotation Costs and WACC

14.1: why cost of capital is important

- We know that the return earned on assets depends on the risk of those assets
- The return to an investor 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

- The required return is the same as the appropriate discount rate and is based on the risk of the cash flows
- We need to know the required return for an investment before we can compute the NPV and make a decision about whether or not to take the investment
- We need to earn at least the required return to compensate our investors for the financing they have provided

- The cost of equity is the return required by equity investors given the risk of the cash flows from the firm
- There are two major methods for determining the cost of equity
 - Dividend growth model (DGM)
 - SML or CAPM

14.2: cost of equity - dividend growth model approach

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

P_0 : price of stock today, D_1 : dividend next year,
 D_0 : dividend this year, g : dividend growth rate,
 R_E : cost of equity

$$P_0 = \frac{D_1}{R_E - g} = \frac{D_0(1 + g)}{R_E - g}$$
$$\Rightarrow R_E = \underbrace{\frac{D_1}{P_0}}_{\text{dividend yield}} + \underbrace{g}_{\text{capital gains yield}}$$

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?

answer:

$$R_E = \frac{D_1}{P_0} + g = \frac{1.50}{25} + .051 = .111 = \mathbf{11.1\%}$$

14.2: estimating the dividend growth rate - example

One method for estimating the growth rate is to use the historical average.

answer:

Year	Dividend	Percent Change
1995	1.23	
1996	1.30	$(1.30 - 1.23) / 1.23 = 5.7\%$
1997	1.36	$(1.36 - 1.30) / 1.30 = 4.6\%$
1998	1.43	$(1.43 - 1.36) / 1.36 = 5.1\%$
1999	1.50	$(1.50 - 1.43) / 1.43 = 4.9\%$

$$\text{Average} = (5.7 + 4.6 + 5.1 + 4.9) / 4 = 5.1\%$$

- **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
 - no allowance for the uncertainty about the growth rate

14.2: cost of equity - sml approach

- Use following info to compute cost of equity:
 - Risk-free rate, R_f
 - Market risk premium, $E(R_M) - R_f$
 - Systematic risk of asset, β

SML (similar to CAPM)

$$\underbrace{R_E}_{\text{cost of equity}} = \underbrace{R_f}_{\text{risk-free rate}} + \beta_E \underbrace{(E(R_M) - R_f)}_{\text{risk premium}}$$

- 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?

$$\begin{aligned}R_E &= R_f + \beta (E(R_M) - R_f) \\ &= 6.1 + (.58)(8.6) \\ &= 11.1\%\end{aligned}$$

- 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

- Explicitly adjusts for systematic risk
- Applicable to all companies, as long as we can compute 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 relying on the past to predict the future, which is not always reliable

14.2: cost of equity - example

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?

answer:

Using DGM:

$$R_E = \frac{D_0(1 + g)}{P_0} + g = \frac{2(1.06)}{15.65} + .06 = 19.55\%$$

Using SML:

$$R_E = R_f + \beta (E(R_M) - R_f) = 6\% + (1.5)(9\%) = 19.5\%$$

- 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
- We may also use estimates of current rates based on the bond rating we expect when we issue new debt
- The cost of debt is NOT the coupon rate

14.3: cost of debt - bond price - example

Suppose we have a bond issue currently outstanding that has 25 years left to maturity. The coupon rate is 9% and coupons are paid semiannually. The bond is currently selling for \$908.72 per \$1,000 bond. What is the cost of debt?

answer:

$$50 \text{ [N]}; \quad 45 \text{ [PMT]}; \quad 1,000 \text{ [FV]}; \quad -908.75 \text{ [PV]};$$

$$\text{[CPT]} \text{ [I/Y]} = 5\% \Rightarrow YTM = 2 \times 5\% = \mathbf{10\%}$$

The long-term debt of Topstone Industries is currently selling for 104.50% of its face value. The issue matures in 10 years and pays an annual coupon of 8%. What is the cost of debt?

answer: 7.35%

14.3: cost of preferred stock

- Preferred stock generally pays a constant dividend every 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 R_P

cost of preferred stock

$$P_0 = \frac{D}{R_P} \Rightarrow R_P = \frac{D}{P_0}$$

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?

answer:

$$R_P = \frac{D}{P_0} = \frac{3}{25} = \mathbf{12\%}$$

14.4: weighted average cost of capital (wacc)

- We can use the individual costs of capital that we have computed to get our “average” cost of capital for the firm.
- This “average” is the required return on our assets, based on the market’s perception of the risk of those assets
- The weights are determined by how much of each type of financing that we use

● Notation

- E = market value of equity = # outstanding shares times price per share
- D = market value of debt = # outstanding bonds times bond price
- P = market value of preferred = # outstanding preferred shares times price per preferred share
- V = market value of the firm = $E + D + P$

● Weights

- $w_E = E/V$ = percent financed with equity
- $w_D = D/V$ = percent financed with debt
- $w_P = P/V$ = percent financed with preferred stock

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?

answer:

$$V = 500 \text{ million} + 475 \text{ million} = 975 \text{ million}$$

$$w_E = E/D = 500/975 = .5128 = 51.28\%$$

$$w_D = D/V = 475/975 = .4872 = 48.72\%$$

Given the following information, what is the value of XYZ Corporation?

Common Stock	14.2 million shares outstanding, price = \$35 per share
Bond Issue 1	\$500 million total face value, price = 102% of face value
Bond Issue 2	\$175 million total face value, price = \$850 per bond

answer: \$1,155.75 million

14.4: debt-equity ratio

instead of the capital structure weights (w_E, w_D) being given, a debt-equity ratio ($\frac{D}{E}$) is also commonly used

debt-equity ratio $\frac{D}{E} \rightarrow$ weight of equity w_E

$$w_E = \frac{E}{V} = \frac{E}{E + D} = \frac{1}{1 + \frac{D}{E}}$$

A firm has a debt-equity ratio of .25. What weight should be given to the equity for the WACC computation?

answer: 80%

14.4: taxes and the wacc

- 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 and preferred

weighted average cost of capital (wacc)

$$WACC = w_E R_E + w_P R_P + w_D R_D(1 - T_C)$$

14.4: wacc - example 1

- Equity Information: 50 million shares, \$80 per share, Beta = 1.15, Market risk premium = 9%, Risk-free rate = 5%. What is the cost of equity?

$$R_E = R_f + \beta (E(R_M) - R_f) = 5 + 1.15(9) = \mathbf{15.35\%}$$

- Debt Information: \$1 billion in outstanding debt (face value), Current quote = 110, Coupon rate = 9% (semiannual coupons), 15 years to maturity. What is the cost of debt?

$$30 \text{ [N]}; \quad 45 \text{ [PMT]}; \quad 1,000 \text{ [FV]}; \quad -1,100 \text{ [PV]};$$

$$\text{[CPT] [I/Y]} = 3.93\% \Rightarrow YTM = 2 \times 3.93\% = \mathbf{7.86\%}$$

14.4: wacc - example 1 (cont.)

- Tax rate = 40%. What is the after-tax cost of debt?

$$R_D(1 - T_C) = 7.86(1 - .4) = \mathbf{4.71\%}$$

- What are the capital structure weights?

$$E = (50 \text{ million})(80) = 4 \text{ billion}$$

$$D = (1 \text{ billion})(1.10) = 1.1 \text{ billion}$$

$$V = 4 + 1.1 = 5.1 \text{ billion}$$

$$w_E = \frac{E}{V} = \frac{4}{5.1} = .7843; \quad w_D = \frac{D}{V} = \frac{1.1}{5.1} = .2157$$

- What is the WACC?

$$WACC = .7843(15.35\%) + .2157(4.71\%) = \mathbf{13.06\%}$$

14.6: weighted average flotation cost

- The required return depends on the risk, not how the money is raised
- However, the cost of issuing new securities should not just be ignored either
- Basic Approach
 - Compute the weighted average flotation cost
 - Use the target weights because the firm will issue securities in these percentages over the long term

weighted average flotation cost

$$f_A = W_E f_E + W_P f_P + W_D f_D$$

The Jamestown Co. has a capital structure which is based on 40% debt, 15% preferred stock, and 45% common stock. The flotation costs are 8% for common stock, 9% for preferred stock, and 4% for debt. What is the weighted average flotation cost?

answer: 6.55%

- we need to know the total cost of a project
- including flotation costs incurred to raise capital needed for project

project cost including flotation costs

$$\text{total project cost} = \frac{\text{capital needed}}{1 - f_A}$$

A firm needs to raise \$165 million for a project. If external financing is used, the firm faces flotation costs of 8% for equity and 2.5% for debt. If the project is to be financed 60% with equity and 40% with debt, how much cash must the firm raise in order to finance the project?

answer: \$175.2 million

The Lingo Co. has a debt-equity ratio of .60. The firm is analyzing a new project which requires an initial cash outlay of \$450,000 for new equipment. The flotation cost for new equity is 10 percent and for debt 5 percent. What is the initial cost of the project including the flotation costs?

answer: \$489,796

14.6: npv without/with flotation costs - example

- Your company is considering a project that will cost \$1 million. The project will generate after-tax cash flows of \$250,000 per year for 7 years. The WACC is 15% and the firm's target D/E ratio is .6 The flotation cost for equity is 5% and the flotation cost for debt is 3%. What is the NPV for the project after adjusting for flotation costs?
 - $D/E = 0.6$ - therefore, $D/V = 6/16 = 0.375$ and $E/V = 10/16 = 0.625$
 - $f_A = (.375)(3\%) + (.625)(5\%) = 4.25\%$
 - True cost is \$1 million / $(1-0.0425) = \$1,044,386$
 - PV of future cash flows = 1,040,105
 - $NPV = 1,040,105 - 1,044,386 = -4,281$
- The project would have a positive NPV of 40,105 without considering flotation costs
- Once we consider the cost of issuing new securities, the NPV becomes negative

Treasury bills currently have a return of 3.5% and the market risk premium is 8%. If a firm has a beta of 1.6, what is its cost of equity?

answer: 16.3%

RMB, Inc. sold a 20-year bond at par 12 years ago. The bond pays an 8% annual coupon, has a \$1,000 face value, and currently sells for \$893.30. What is the firm's cost of debt?

answer: 10.0%

The market value of DRK Inc. debt is \$200 million and the total market value of the firm is \$600 million. The cost of equity is 15%, the cost of debt is 8%, and the tax rate is 34%. What is this firm's WACC?

answer: 11.76%

Hartley Inc. needs to purchase equipment for its 2,000 drive-ins nationwide. The total cost of the equipment is \$2 million. Aftertax cash inflows from the project will be \$210,000 annually in perpetuity. Hartley has a market value debt-to-assets ratio of 40%. The firm's cost of equity is 13%, its pretax cost of debt is 8%, and the flotation costs of debt and equity are 2% and 8%, respectively. The tax rate is 34%.

- 1 What is Hartley's weighted average cost of capital?
- 2 Ignoring flotation costs, what is the NPV of the proposed project?
- 3 What is the weighted average flotation cost for Hartley?
- 4 What is the dollar flotation cost for the proposed financing?
- 5 After considering flotation costs, what is the NPV of the proposed project?

answer: 9.91%; \$119,072; 5.6%; \$118,644; \$428