CHAPTER 3
COST OF CAPITAL – “CORPORATE FINANCE SECTION”

1. INTRODUCTION

- The **cost of capital** is the cost of using the funds of creditors and owners.
- Creating value requires investing in capital projects that provide a return greater than the project's cost of capital.
  - When we view the firm as a whole, the firm creates value when it provides a return greater than its cost of capital.
- Estimating the cost of capital is challenging.
  - We must estimate it because it cannot be observed.
  - We must make a number of assumptions.
  - For a given project, a firm's financial manager must estimate its cost of capital.

2. COST OF CAPITAL

- The **cost of capital** is the rate of return that the suppliers of capital—bondholders and owners—require as compensation for their contributions of capital.
  - This cost reflects the opportunity costs of the suppliers of capital.
- The cost of capital is a marginal cost: the cost of raising additional capital.
- The **weighted average cost of capital (WACC)** is the cost of raising additional capital, with the weights representing the proportion of each source of financing that is used.
  - Also known as the **marginal cost of capital (MCC)**.

WACC

$$\text{WACC} = w_d r_d (1 - t) + w_p r_p + w_e r_e \quad (3\text{-}1)$$

where

- w_d is the proportion of debt that the company uses when it raises new funds
- r_d is the before-tax marginal cost of debt
- t is the company's marginal tax rate
- w_p is the proportion of preferred stock the company uses when it raises new funds
- r_p is the marginal cost of preferred stock
- w_e is the proportion of equity that the company uses when it raises new funds
- r_e is the marginal cost of equity

EXAMPLE: WACC

Suppose the Widget Company has a capital structure composed of the following, in billions:

Debt	€10
Common equity	€40

If the before-tax cost of debt is 9%, the required rate of return on equity is 15%, and the marginal tax rate is 30%, what is Widget's weighted average cost of capital?

Solution:

WACC = [(0.20)(0.09)(1 – 0.30)] + [(0.8)(0.15)]

= 0.0126 + 0.120

= 0.1325, or 13.25%

EXAMPLE: WACC

Interpretation:

When the Widget Company raises €1 more of capital, it will raise this capital in the proportions of 20% debt and 80% equity, and its cost will be 13.25%.

TAXES AND THE COST OF CAPITAL

- Interest on debt is tax deductible; therefore, the cost of debt must be adjusted to reflect this deductibility.
  - We multiple the before-tax cost of debt (r_d) by the factor (1 – t), with t as the marginal tax rate.
  - Thus, $r_d \times (1 - t)$ is the after-tax cost of debt.
- Payments to owners are not tax deductible, so the required rate of return on equity (whether preferred or common) is the cost of capital.

WEIGHTS OF THE WEIGHTED AVERAGE

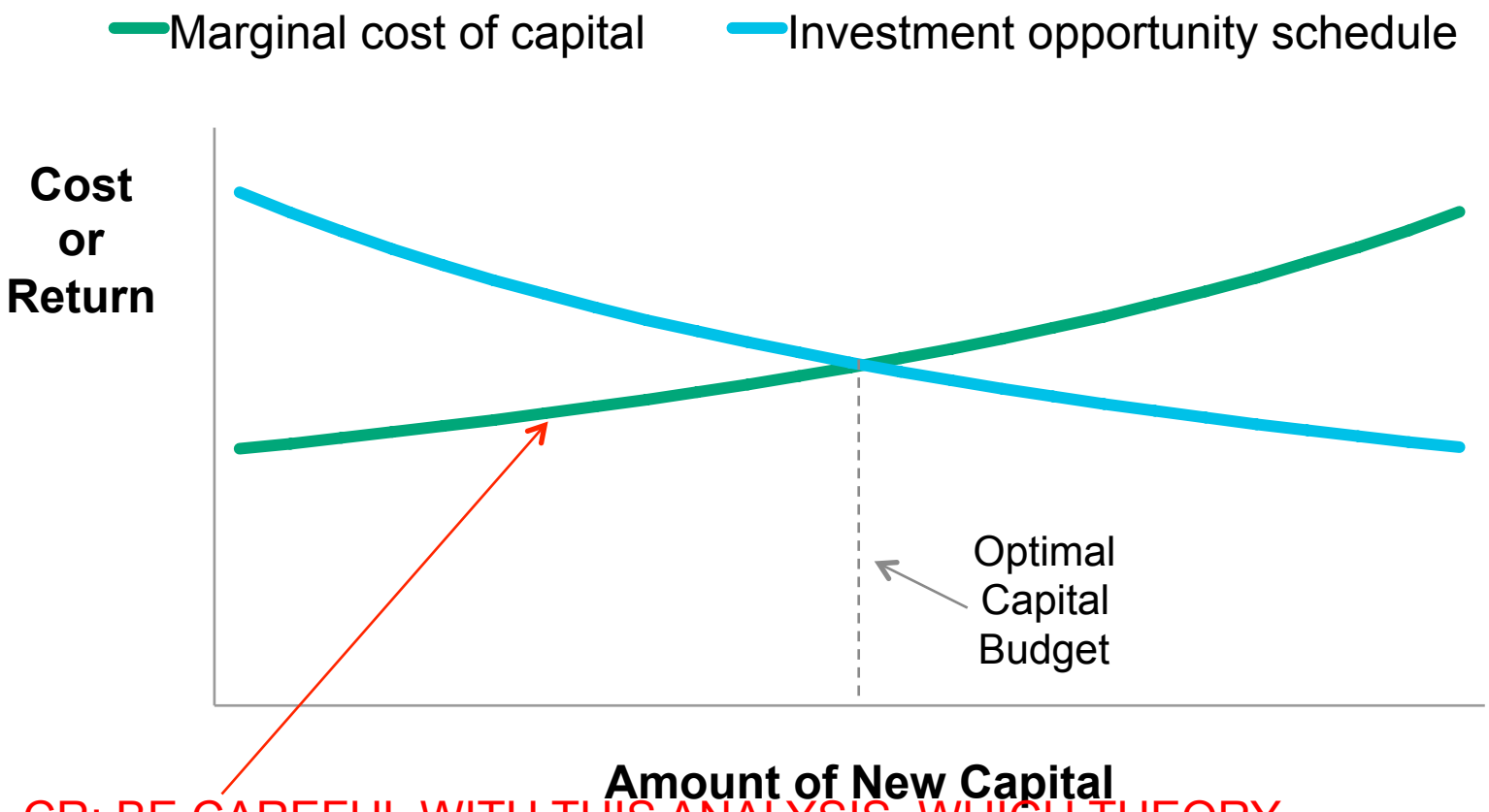
- The weights should reflect how the company will raise additional capital.
- Ideally, we would like to know the company's **target capital structure**, which is the capital structure that is the company's goal, but we cannot observe this goal.
- Alternatives
  - Assess the market value of the company's capital structure components.
  - Examine trends in the company's capital structure.
  - Use capital structures of comparable companies (e.g., weighted average of comparables' capital structure).

APPLYING THE COST OF CAPITAL TO CAPITAL BUDGETING AND SECURITY VALUATION

- The **investment opportunity schedule (IOS)** is a representation of the returns on investments.
- We assume that the IOS is downward sloping: the more a company invests, the lower the additional opportunities.
  - That is, the company will invest in the highest-returning investments first, followed by lower-yielding investments as more capital is available to invest.
- The **marginal cost of capital (MCC)** schedule is the representation of the costs of raising additional capital.
  - We generally assume that the MCC is upward sloping: the more funds a company raises, the greater the cost.

CR: BE CAREFUL WITH THIS ASSUMPTION

OPTIMAL INVESTMENT DECISION

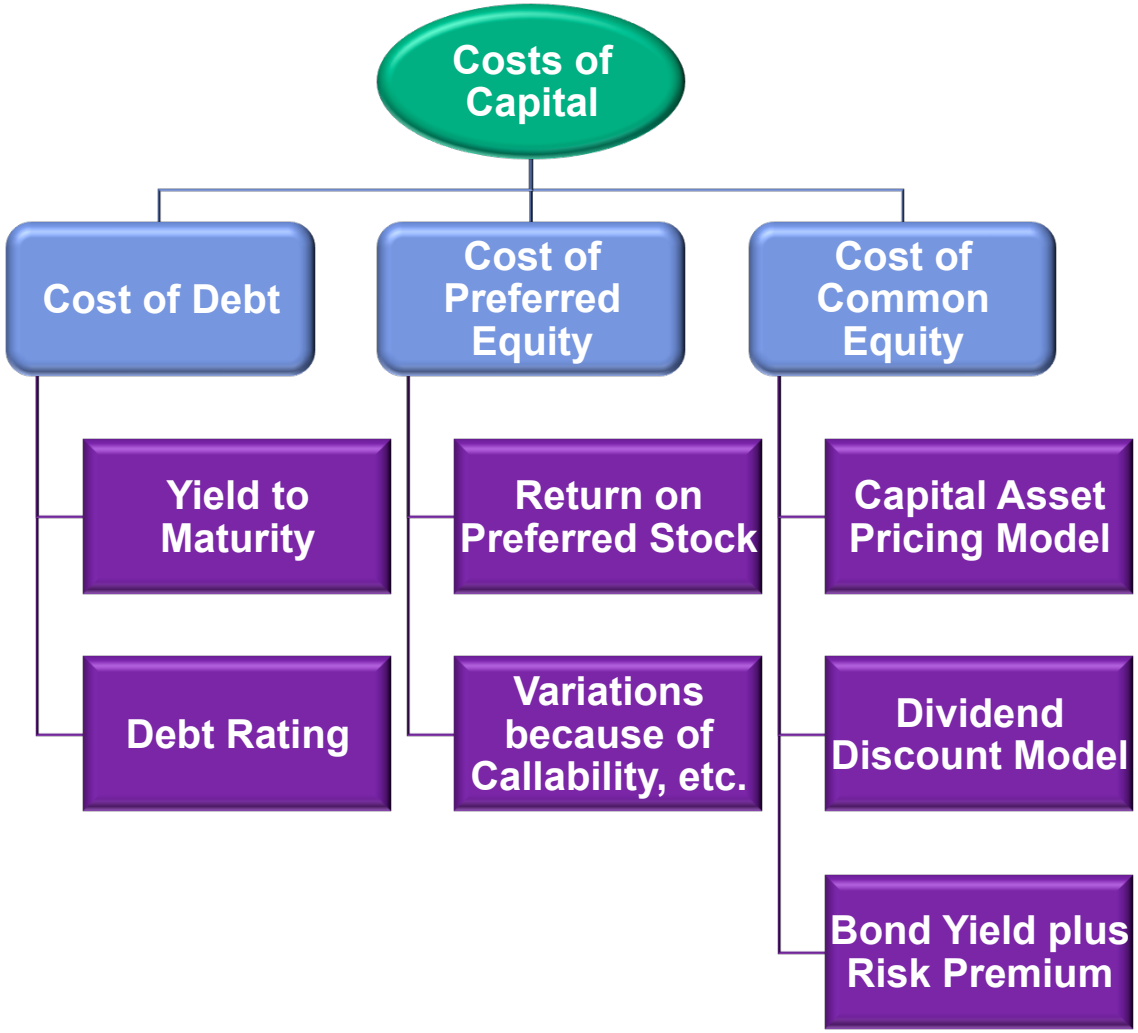


CR: BE CAREFUL WITH THIS ANALYSIS. WHICH THEORY PREDICTS THIS? IS THE RISK CHANGING?? DOES THE WACC INCREASE AS COMPANIES USE MORE CAPITAL OVERALL? NOT NECESSARILY! IT WILL DEPEND ON THE RISKINESS/TYPE OF PROJECT UNDER ANALYSIS

USING THE MCC IN CAPITAL BUDGETING AND ANALYSIS

- The WACC is the marginal cost for additional funds and, hence, additional investments.
- In capital budgeting
  - We use the WACC, adjusted for project-specific risk, to calculate the net present value (NPV).
  - Using a company's overall WACC in evaluating a capital project assumes that the project has risk similar to the average project of the company.
- In analysis
  - Analysts can use the WACC in valuing the company by discounting cash flows to the firm.

3. COSTS OF THE DIFFERENT SOURCES OF CAPITAL



THE COST OF DEBT

Alternative approaches

1. **Yield-to-maturity approach:** Calculate the yield to maturity on the company's current debt.
2. **Debt-rating approach:** Use yields on comparably rated bonds with maturities similar to what the company has outstanding.

EXAMPLE: COST OF DEBT

Yield-to-Maturity Approach

Consider a company that has $100 million of debt outstanding that has a coupon rate of 5%, 10 years to maturity, and is quoted at $98. What is the after-tax cost of debt if the marginal tax rate is 40%? Assume semi-annual interest.

Solution:

$r_d = 0.0526 (1 – 0.4) = 3.156\%$

The cost of debt capital is 3.156%

Debt-Rating Approach

Consider a company that has nontraded $100 million of debt outstanding that has a debt-rating of AA. The yield on AA debt is currently 6.2%. What is the after-tax cost of debt if the marginal tax rate is 40%?

Solution:

$r_d = 0.062 (1 – 0.4) = 3.72\%$

The cost of debt capital is 3.72%

CR: NOTICE THAT THERE IS NO DISCUSSION WHATSOEVER ON DEBT BEING RISKY AND EXPECTED RETURNS LOWER THAN “PROMISED” YIELDS

ISSUES IN ESTIMATING THE COST OF DEBT

- The cost of floating-rate debt is difficult because the cost depends not only on current rates but also on future rates.
  - Possible approach: Use current term structure to estimate future rates.
- Option-like features affect the cost of debt.
  - If the company already has debt with embedded options similar to what it may issue, then we can use the yield on current debt.
  - If the company is expected to alter the embedded options, then we would need to estimate the yield on the debt with embedded options.
- Nonrated debt makes it difficult to determine the yield on similarly yielding debt if the company's debt is not traded.
  - Possible remedy: Estimate rating by using financial ratios.
- Leases are a form of debt, but there is no yield to maturity.
  - Estimate by using the yield on other debt of the company.

THE COST OF PREFERRED STOCK

The cost of preferred stock that is noncallable and nonconvertible is based on the perpetuity formula:

$$P_p = D_p / r_p \quad \rightarrow \quad r_P = D_p / P_p \qquad (3\text{-}3)$$

Problem

Suppose a company has preferred stock outstanding that has a dividend of $1.25 per share and a price of $20. What is the company's cost of preferred equity?

Solution

$r_p = \$1.25 / \$20 = 0.0625, \text{ or } 6.25\%$

THE COST OF EQUITY

Methods of estimating the cost of equity:

1. Capital asset pricing model
2. Dividend discount model
3. Bond yield plus risk premium

USING THE CAPM TO ESTIMATE THE COST OF EQUITY

The capital asset pricing model (CAPM) states that the expected return on equity, $E(R_i)$, is the sum of the risk-free rate of interest, R_F, and a premium for bearing market risk, β_i $[E(R_M) - R_F]$:

$$E(R_i) = R_F + \beta_i [E(R_M) - R_F] \quad (3\text{-}4)$$

where

β_i	is the return sensitivity of stock *i* to changes in the market return
$E(R_M)$	is the expected return on the market
$E(R_M) - R_F$	is the expected market risk premium or **equity risk premium** (**ERP**)

EXAMPLE: COST OF EQUITY USING THE CAPM

Problem:

If the risk-free rate is 3%, the expected market risk premium is 5%, and the company's stock beta is 1.2, what is the company's cost of equity?

Solution:

Cost of equity = 0.03 + (1.2 × 0.05) = 0.03 + 0.06 = 0.09, or 9%

ALTERNATIVES TO THE CAPM

- Alternative models may be used to capture expected returns to risk factors not incorporated in the CAPM. For example, we can use a factor model to estimate the cost of equity:

$$E(R_i) = R_F + \beta_{i1}(\blacksquare Factor\ risk@premium)_1 + \beta_{i2}(\blacksquare Factor\ risk@premium)_2 + \ldots + \beta_{ij}(\blacksquare Factor\ risk@premium)_j \quad (3\text{-}5)$$

where

β_{ij} = stock *i*'s sensitivity to changes in the *j*th factor

$(\blacksquare Factor\ risk@premium)_j$ = the expected risk premium for the *j*th factor

- We can also use the **historical equity risk premium approach**, which requires estimating the average annual return over a historical period.
  - Issues:
    - Level of risk of stocks may change.
    - Risk aversion of investors may change.

USING THE DIVIDEND VALUATION MODEL TO ESTIMATE THE COST OF EQUITY

- The **dividend discount model (DDM)** assumes that the value of a stock today is the present value of all future dividends, discounted at the required rate of return.
- Assuming a constant growth in dividends:

which we can rearrange to solve for the required rate of return:

(3-6)

- We can estimate the growth rate, *g*, by using third-party estimates of the company's dividend growth or estimating the company's sustainable growth.
- The sustainable growth is the product of the return on equity (ROE) and the retention rate (1 minus the dividend payout ratio, or):

ROE

USING THE DDM TO ESTIMATE THE COST OF EQUITY

Problem

Suppose the Gadget Company has a current dividend of £2 per share. The current price of a share of Gadget Company stock is £40. The Gadget Company has a dividend payout of 20% and an expected return on equity of 12%. What is the cost of Gadget common equity?

Solution

Using the dividend payout and the return on equity, we calculate *g*:

$$g = (1 - 0.2) \times 0.12 = 0.96, \text{ or } 9.6\%$$

Then we insert *g* into the required rate of return formula:

$$r_e = £2\,(1 + 0.096)/£40 + 0.096 = 0.0548 + 0.096 = 0.1508, \text{ or } 15.08\%$$

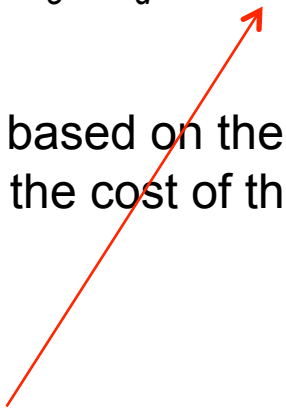
If Gadget raises new common equity capital, its cost is 15.08%.

USING THE BOND YIELD PLUS RISK PREMIUM APPROACH TO ESTIMATING THE COST OF EQUITY

- The **bond yield plus risk premium approach** requires adding a premium to a company's yield on its debt:

$$r_e = r_d + \text{Risk premium} \qquad (3\text{-}8)$$

  - This approach is based on the idea that the equity of the company is riskier than its debt, but the cost of these sources move in tandem.



CR: THIS IS A TOTALLY AD-HOC ADJUSTMENT… NOT FOLLOWING THE MM ANALYSIS AND SUBSEQUENT THEORY…

4. TOPICS IN COST OF CAPITAL ESTIMATION

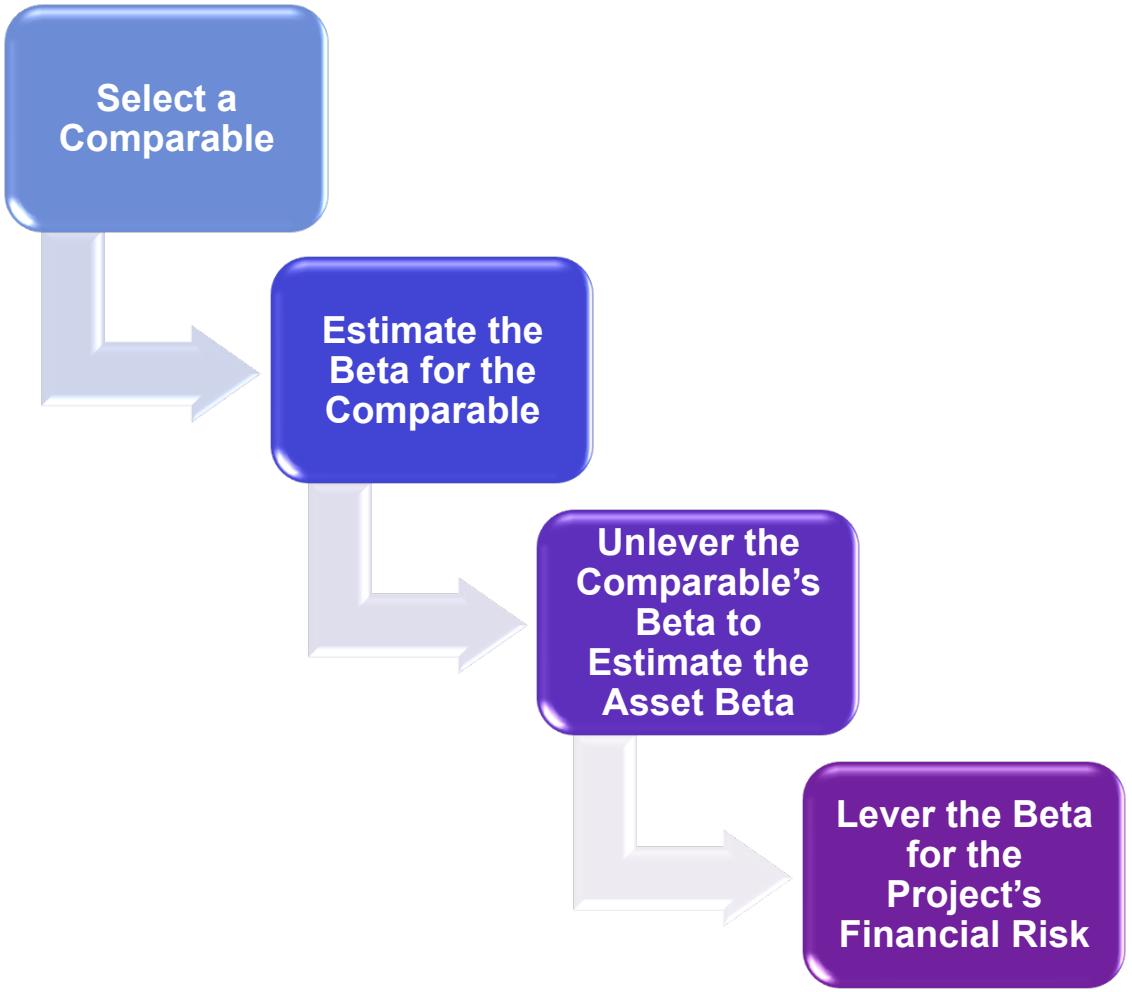
- Estimating a project's beta
- Estimating country-risk premiums
- Using an upward-sloping marginal cost of capital schedule
- Dealing with flotation costs

PROJECT BETAS

Issues in estimating a beta:

- Judgment is applied in estimating a company's beta regarding the estimation period, the periodicity of the return interval, the appropriate market index, the use of a smoothing technique, and adjustments for small company stocks.
- If a company is not publicly traded or if we are estimating a project's beta, then we need to look at the risk of the company or project and use comparables.
- When selecting a comparable for the estimation of a project beta, we ideally would like to find a company with a single line of business, and that line of business matches that of the project.
  - This ideal comparable is a **pure play**.
  - We use the beta of the comparable company to estimate an **asset beta** (beta reflecting only business risk) and then use it for the subject project or company.

USING COMPARABLES TO ESTIMATE BETA



LEVERING AND UNLEVERING BETA

To unlever beta, remove the comparable's capital structure from the beta to arrive at the asset beta, which reflects the company's business risk:

$$\beta_{asset} = \beta_{equity}\ [1/1+((1-t)D/E)] \quad (3\text{-}9)$$

To lever the beta, adjust for the project's financial risk:

$$\beta_{equity} = \beta_{asset}\ [1+((1-t)D/E)] \quad (3\text{-}10)$$

CR:
THIS METHOD USES (THEY MIGHT NOT KNOW IT) TWO IMPORTANT UNDERLYING ASSUMPTIONS:
(1) THAT DEBT IS PRE-DETERMINED AND PERPETUAL, "D".
(2) THAT DEBT HAS THE ZERO RISK

EXAMPLE: LEVERING AND UNLEVERING BETAS

Problem

Consider the following information for the Whatsit Project and its comparable, Thatsit Company:

	Whatsit Project	**Thatsit Company**
Debt	€10	€100
Equity	€40	€200
Equity beta	?	1.4

What is the asset beta and equity beta for the Whatsit Project based on the comparable company information and a tax rate of 40% for both companies?

Solution

$\beta_{asset} = 1.4 \{1 \div [1 + (1 - 0.4)(100 \div 200)]\} = 1.4 \times 0.76923 = 1.0769$

$\beta_{equity} = 1.0769 [1 + (1 - 0.4)(10 \div 40)] = 1.0769 \times 1.15 = 1.2384$

The beta of the Whatsit Project is 1.2384

COUNTRY RISK PREMIUM

- The **country risk premium** is the additional risk premium associated with doing business in a developing nation.
- The additional premium, added to the required rate of return estimated from the CAPM, is the **country equity premium,** or the **country spread**.
- To estimate the country risk premium:
  - Use the sovereign yield spread, which is the difference in government bond yields.
  - Adjust the sovereign yield spread by a factor that is the ratio of the
    - annualized standard deviation of the developing nation's equity index to the
    - annualized standard deviation of the sovereign bond market in the developed market currency.

THE UPWARD-SLOPING MARGINAL COST OF CAPITAL SCHEDULE

- The marginal cost of capital schedule may slope upward, with higher costs for raising more capital.
- The cost of capital may increase for many reasons, including:
  - Bond covenants restricting additional bond issuance.
  - Deviations from target capital schedule because capital is not raised in small increments but rather may be raised periodically to minimize issuance costs.
  - The point at which the cost of capital changes is the break point:

Break *point = Amount of capital at which the source's cost of capital changes/ Proportion of new capital raised from the source*

CR: THE EXAMPLES IN THE CFA PREP BOOKS INCLUDE THIS. BUT NOTICE THAT IN THEIR “AD-HOC” CHOICE OF INCREASING COST OF DEBT, THIS IS NOT DONE “IN EQUILIBRIUM”… AND THEY END UP SHOWING US AN OPTIMAL CAPITAL STRUCTURE WITH THE LOWEST WACC, ETC… ALTHOUGN THEY ONLY EXPLICITKY CONSIDER THE ITS AS A FACTOR OF DEVIATION FROM MM’S PERFECT WORLD. YOU KNOW BETTER THAN THAT.

FLOTATION COSTS

- A **flotation cost** is the investment banking fee associated with issuing securities.
- There are two treatments for flotation costs:
  1. Adjust the price of the security in the return calculation by the flotation cost, or
  2. Adjust the NPV of the project for the monetary cost of flotation.
- Adjusting the NPV is preferred because the flotation costs occur immediately rather than affect the company throughout the life of the project.

Problem

Suppose a company has a project with an NPV of $100 million. If the company issues $1 billion of equity to finance this project and the flotation costs are 1.2%, what is the NPV after adjusting for flotation costs?

Solution

NPV = $100 million – $12 million = $88 million

WHAT DO CFOS DO?

- Cost of equity: Single-factor CAPM
- Project cost of capital: Single cost of capital, but some use an adjustment for individual projects

5. SUMMARY

- The weighted average cost of capital is a weighted average of the after-tax marginal costs of each source of capital.
- An analyst uses the WACC in valuation. For example, the WACC is used to value a project using the net present value method.
- The before-tax cost of debt is generally estimated by means of one of two methods: yield to maturity or bond rating.
- The yield-to-maturity method of estimating the before-tax cost of debt uses the familiar bond valuation equation.
- Because interest payments are generally tax deductible, the after-tax cost is the true, effective cost of debt to the company.
- The cost of preferred stock is the preferred stock dividend divided by the current preferred stock price.
- The cost of equity is the rate of return required by a company's common stockholders. We estimate this cost using the CAPM (or its variants) or the dividend discount method.

SUMMARY (CONTINUED)

- The CAPM is the approach most commonly used to calculate the cost of common stock.
- When estimating the cost of equity capital using the CAPM when we do not have publicly traded equity, we may be able to use the pure-play method, in which we estimate the unlevered beta for a company with similar business risk and then lever that beta to reflect the financial risk of the project or company.
- It is often the case that country and foreign exchange risk are diversified so that we can use the estimated β in the CAPM analysis. However, in the case in which these risks cannot be diversified away, we can adjust our measure of systematic risk by a country equity premium to reflect this nondiversified risk:
- The dividend discount model approach is an alternative approach to calculating the cost of equity.

SUMMARY (CONTINUED)

- We can estimate the growth rate in the dividend discount model by using published forecasts of analysts or by estimating the sustainable growth rate:
- In estimating the cost of equity, an alternative to the CAPM and dividend discount approaches is the bond yield plus risk premium approach.
- The marginal cost of capital schedule is an illustration of the cost of funds for different amounts of new capital raised.
- Flotation costs are costs incurred in the process of raising additional capital. The preferred method of including these costs in the analysis is as an initial cash flow in the valuation analysis.
- Survey evidence indicates that the CAPM method is the most popular method used by companies in estimating the cost of equity.