

R30 Cost of Capital - Foundational Topics

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1. Introduction

This reading defines what is cost of capital, methods to estimate the cost of capital, and why estimating the cost of capital accurately is important, both for decision-making by a company's management and for valuation by investors. Estimating the cost of capital is a complex process which requires many assumptions.

This reading covers:

- Introduction to the cost of capital and its basic computation
- Methods for estimating the costs of the various sources of capital: debt, preferred stock, and common equity
- Beta estimation for public and non-public companies
- Correct treatment of floatation costs
- Methods used in practice by companies

2. Cost of Capital

Cost of capital is the rate of return that the suppliers of capital require as compensation for their contribution of capital. Assume a company decides to build a steel plant and needs money or capital for it. Investors such as bondholders or equity holders will lend this capital to the company. Suppliers of capital will be motivated to part with their money for a certain period of time if the money invested can earn a greater return than it would earn elsewhere. In short, investors will invest if the return (IRR) is greater than the cost of capital.

A company has access to several sources of capital such as issuing equity, debt, or instruments that share characteristics of both debt and equity. Each source becomes a component of the company's funding and has a specific cost associated with it called the **component cost of capital**.

The cost of capital is the rate of return expected by investors for average-risk investment in a company. Investors will demand a higher rate of return for higher-than-average-risk investments. Similarly, investors will demand a lower rate of return for lower-than-average-risk investments.

One way of calculating this cost is to determine the **weighted average cost of capital (WACC)**, which is also called the **marginal cost of capital**. It is called marginal because it is the additional or incremental cost a company incurs to issue additional debt or equity.

Three common sources of capital are common shares, preferred shares, and debt. WACC is the cost of each component of capital in the proportion they are used in the company.

$$WACC = w_d r_d (1 - t) + w_p r_p + w_e r_e$$

where:

w_d = proportion of debt that the company uses when it raises new funds

r_d = before-tax marginal cost of debt

t = company's marginal tax rate

w_p = proportion of preferred stock the company uses when it raises new funds

r_p = marginal cost of preferred stock

w_e = proportion of equity that the company uses when it raises new funds

r_e = the marginal cost of equity

The weights are the proportions of the various sources of capital that the company uses. The weights should represent the company's **target capital structure** and not the current capital structure. For example, suppose that current capital structure of a company is 33.3% debt, 33.3% preferred stock and 33.3% common stock. To fund a new project, the company plans to issue more debt and its capital structure will change to 50% debt, 25% preferred stock, and 25% common stock. WACC calculations should be based on these new weights, i.e., the target weights.

Example

IFT has the following capital structure: 30 percent debt, 10 percent preferred stock, and 60 percent equity. IFT wants to maintain these weights as it raises additional capital. Interest expense is tax deductible. The before-tax cost of debt is 8 percent, cost of preferred stock is 10 percent, and cost of equity is 15 percent. If the marginal tax rate is 40 percent, what is the WACC?

Solution:

$$\text{WACC} = (0.3) (0.08) (1 - 0.4) + (0.1) (0.1) + (0.6) (0.15) = 11.44 \text{ percent}$$

Note: Before-tax cost of debt is given. Do not forget to calculate the after-tax cost.

Example

Machiavelli Co. has an after-tax cost of debt capital of 4 percent, a cost of preferred stock of 8 percent, a cost of equity capital of 10 percent, and a weighted average cost of capital of 7 percent. Machiavelli Co. intends to maintain its current capital structure as it raises additional capital. In making its capital budgeting decisions for the average risk project, what is the relevant cost of capital?

Solution:

The relevant cost of capital is 7%. The WACC using weights derived from the current capital structure is the best estimate of the cost of capital for the average risk project of a company.

2.1. Taxes and the Cost of Capital

Notice that in the equation for WACC, we consider taxes only for debt. This is because payments to equity shareholders in the form of dividends are not tax-deductible. On the other hand, interest costs are tax-deductible in some jurisdictions; they pass through the income statement and provide a tax shield. If interest expense is not tax deductible, then the tax rate applied is zero and effective marginal cost of debt is equal to cost of debt (r_d). Let us

see the effect on net income in the example below.

A company pays 10% interest on capital raised. On the left-hand side of the table below, you see that the interest is tax deductible. On the right-hand side, the interest is not tax deductible. So, the tax expense on the LHS is 16, which is 4 less than that on the RHS. The savings on taxes consequently reflect in the net income as well. The actual cost of debt is 6% when it is tax-deductible instead of 10%.

Calculation of net income assuming interest is tax-deductible		Calculation of net income assuming interest is not tax-deductible	
Revenue	100	Revenue	100
Operating Expenses	50	Operating Expenses	50
Interest	10	EBT	50
EBT	40	Tax expense (40%)	20
Tax Expense (40%)	16	Interest Expense	10
Net Income	24	Net Income	20

After-tax cost of debt = Before-tax cost of debt x (1 - tax rate)

3. Costs of the Various Sources of Capital

Each source of capital has a different cost because of differences in seniority, contractual commitments, and potential value as a tax shield. Three primary sources of capital are:

- Debt
- Preferred equity
- Common equity

3.1 Cost of Debt

Cost of debt is the cost of financing to a company using debt instruments such as taking a bank loan or issuing a bond. In simpler terms, it is the effective interest rate a company pays on its current debt. Two methods to estimate the before-tax cost of debt are:

- The yield to maturity (YTM) approach
- Debt-rating approach

Yield to Maturity Approach

YTM is the annual return an investor earns if the bond is purchased today and held until maturity. It is the rate at which the present value of all future cash flows equals the market price of the bond.

$$P_0 = \sum_{t=1}^n \left[\frac{PMT_t}{\left(1 + \frac{r_d}{2}\right)^t} \right] + \frac{FV}{\left(1 + \frac{r_d}{2}\right)^n}$$

where:

P_0 = the current market price of the bond

PMT_t = interest payment in period t

r_d = the yield to maturity
 n = number of periods remaining to maturity
 FV = maturity value of the bond

Example

A company issues a 10-year, 8% semi-annual coupon bond. Upon issuance, the bond sells for \$980. If the marginal tax rate is 30%, what is the after-tax cost of debt?

Solution:

First, calculate the before-tax cost of debt by entering the following values:

$N = 20$ because it is a semi-annual coupon bond, so there are $10 \times 2 = 20$ periods.

$PV = -980$; the price at which the bond is current selling

$FV = 1000$; the face value of the bond that will be repaid at maturity (the face value of the bond is not explicitly given but assume it is the nearest round figure.)

$PMT = (0.08/2) \times 1000 = 40$ (Coupons are always paid on the face value)

Compute $I/Y = 4.15\%$

Annual $I/Y = 4.15 \times 2 = 8.30 =$ before-tax cost of debt

After-tax cost of debt $= 8.30 (1 - 0.3) = 5.8\%$

Debt Rating Approach

This method is used when the company's debt doesn't have an YTM as it is not publicly traded. In such case, the approach is as follows:

- Determine the current market rates for comparable bonds with similar ratings and maturities (using matrix pricing).
- Analyze the company characteristics like covenants, seniority, etc. to get before-tax cost of debt.
- Apply the marginal tax rate to arrive at the after-tax cost of debt.

Example

A company's capital structure includes debt with an average maturity of 10 years. The company's rating is AA, and it has a marginal tax rate of 30%. The yield on comparable AA bonds with similar maturity is 5%. Compute the company's after-tax cost of debt.

Solution:

The company's after-tax cost of debt is:

$$r_d(1 - t) = 5\%(1 - 0.3) = 3.5\%$$

3.2 Cost of Preferred Stock

The cost of preferred stock is the cost that a company has committed to pay to preferred stockholders in the form of preferred dividend. Preferred stock has the characteristics of both debt and equity. Unlike common dividend which is variable, preferred dividend is

usually fixed and paid before common shareholders. The cost of preferred stock can be computed as:

$$P_p = \frac{D_p}{r_p}$$

where:

P_p = the current preferred stock price per share

D_p = the preferred stock dividend per share

r_p = the cost of preferred stock

Example

A company issues preferred stock with par value \$100 that is currently valued at \$125 per share. The preferred dividend is \$5 per share. The marginal tax rate is 33 percent. What is the cost of preferred stock?

Solution:

Cost of preferred stock = $5/125 = 4\%$

Note: We ignore taxes, because unlike interest payments, dividends are not tax deductible.

3.3 Cost of Common Equity

Cost of common equity, or cost of equity, is the rate of return required by a company's common shareholders. It is the return expected by investors for the risk they undertake. Unlike debt and preferred stock, estimating the cost of equity is challenging because of the uncertain nature of future cash flows.

Two commonly used methods to estimate the cost of equity are:

- Capital asset pricing model
- Bond yield plus risk premium method

Capital Asset Pricing Model (CAPM) Approach

According to this method, the cost of equity is equal to the risk-free rate plus a premium for bearing the security's market risk. The premium is the beta for the security multiplied by the equity risk premium.

$$r_e = RFR + \beta [E(R_{mkt}) - RFR]$$

where:

r_e = the cost of equity

RFR = risk-free rate of an asset

β = the sensitivity of a stock's return to changes in market return

$E(R_{mkt})$ = expected return on the market

$[E(R_{mkt}) - RFR]$ is also called the equity risk premium because it is the premium that investors expect for investing in the market relative to the risk-free rate.

Example

In a developing market, the risk-free rate is 10% and the equity risk premium is 6%. The equity beta for a given company is 2. What is the cost of equity using the CAPM approach?

Solution:

$$r_e = 0.1 + 2 [0.06] = 22\%$$

To estimate the risk-free rate, we use the yields on long-term government bonds with maturity close to the useful life of the project. To estimate the equity risk premium, we use historical returns. Historical equity risk premium is a good indicator of expected equity risk premium.

Bond Yield plus Risk Premium Method

The bond yield plus risk premium method is commonly used for companies with publicly traded debt. It provides a quick estimate of the cost of equity for such companies.

In this method, we add a risk premium to the yield on the firm's long-term debt. The assumption here is that the return on a company's equity will be greater than the return on the company's bond, as equity is riskier than the bond.

$$r_e = \text{bond yield} + \text{risk premium}$$

Example

A company's interest rate on long-term debt is 8%. The risk premium of equity is estimated to be 5%. What is the cost of equity?

Solution:

$$r_e = 8\% + 5\% = 13\%$$

4. Estimating Beta

A firm's beta is used to estimate its required return on equity. Beta is a measure of the company's systematic or market related risk. Riskier firms will have higher betas, whereas less riskier firms will have lower betas.

4.1 Estimating Beta for Public Companies

For a public company, beta is computed by regressing the return on the stock with the return on the market. The regression equation is: $R_i = \alpha_i + \beta_i * R_M$. The return on market is plotted on the x-axis as an independent variable. The return on stock is plotted on the y-axis as a dependent variable. The slope of the best-fit line through this data is the regression beta. Regression beta is also called an unadjusted or raw historical beta. Such a beta estimate is influenced by:

- The choice of index used to represent the market. For US equities, indexes such as the S&P 500 and NYSE are used.

- The length of data and frequency of observation. Often, five years of monthly data are used.

Adjusted beta: In the long-term, beta has been observed to have a mean-reverting value of 1. Beta for high-risk stocks is more than 1 but it gradually drifts towards 1. Similarly, beta for low-risk stocks is less than 1 but it gradually drifts towards 1. Therefore, some analysts adjust the raw beta using the 'Blume method' as shown below:

$$\text{Adjusted beta} = \frac{2}{3} * \text{unadjusted beta} + \frac{1}{3} * 1.0$$

Example: If the beta from a regression of an asset's returns on the market return is 1.20, calculate its adjusted beta.

Solution:

$$\text{Adjusted beta} = (2/3)(1.20) + (1/3)(1.0) = 1.13.$$

4.2 Estimating Beta for Thinly Traded and Nonpublic Companies

For companies that are thinly traded or private companies, beta cannot be determined through regression, as market price information is not readily available. So, betas of publicly traded comparable companies are used as a proxy. A four-step process is followed to make adjustments:

Step 1: Select the benchmark public company

Step 2: Estimate benchmark's beta

Step 3: Unlever the benchmark's beta, i.e., estimate the beta without the impact of debt (or leverage). The formula for unlevering beta is:

$$\beta_U = \beta_E \left[\frac{1}{1 + (1 - t) \frac{D}{E}} \right]$$

where:

β_U = unlevered beta

D = debt of benchmark company

E = equity of benchmark company

β_E = beta of benchmark company

Step 4: Lever the beta to reflect the subject company's financial leverage. The formula for calculating the beta of the subject company is:

$$\beta'_E = \beta_U \left[1 + (1 - t) \frac{D'}{E'} \right]$$

where:

β'_E = beta of subject company

D' = debt of subject company

E' = equity of subject company

β_U = unlevered beta (benchmark)

Example

AA Corp. is a large conglomerate and wants to determine the equity beta of its food division. This division has a D/E ratio of 0.7. The tax rate is 40%. A comparable publicly traded food company has an equity beta of 1.2 and a D/E ratio of 0.5. What is the equity beta of AA's food division?

Solution:

We can calculate the equity beta of AA's food division as:

1. Unlevered beta of publicly traded food company = $1.2 * \frac{1}{1 + 0.6(0.5)} = 0.923$
2. Levered equity beta of AA's food division = $0.923 [1 + 0.6 \times 0.7] = 1.31$

Inference: Since AA's food division has more debt than the publicly traded company, it is riskier and has a higher beta value.

5. Flotation Costs

Flotation costs are the fees charged by investment bankers when a company raises external capital. There are two approaches to deal with flotation costs:

Approach 1: Incorporate flotation costs into the cost of capital. This will increase the cost of capital.

$$r_e = \frac{D_i}{(P_0 - F)} + g$$

For example, consider a company that has a current dividend of \$5 per share, a current price of \$100 per share and an expected growth rate of 10%. The cost of equity without considering flotation costs would be:

$$r_e = \frac{\$5 \times 1.1}{\$100} + 0.1 = 0.155 \text{ or } 15.5\%$$

If the flotation costs are 3% of the issuance, the cost of equity considering the flotation costs would be:

$$r_e = \frac{\$5 \times 1.1}{\$100 - \$3} + 0.1 = 0.1567 \text{ or } 15.67\%$$

However, the problem with this approach is that flotation costs are not an ongoing expense; they are a cost that the firm incurs at the start of the project. Hence, we should not be discounting all future cash flows at a higher cost of capital. The correct way to treat flotation costs is to use approach 2.

Approach 2: We adjust the initial cash flow by the amount of flotation costs. We do not adjust the discount rate.

Let's say in the above example, the company raised \$100,000 for a project by issuing new shares. The floatation costs would be 3% of \$100,000 i.e. \$3,000. In this approach we increase the initial cash outlay of the project to \$103,000. The cost of equity, however, remains unchanged at 15.5%.

6. Methods in Use

In this reading, we saw several methods to estimate the cost of capital for a company or project. A survey of a large number of company CFOs to understand the methods they use to estimate the cost of capital revealed the following:

- The capital asset pricing model is the commonly used model. The single-factor capital asset pricing model is the most popular one.
- Few companies use the dividend cash flow model.
- Publicly traded companies were more likely to use the capital asset pricing model than private companies.
- Most companies used a single cost of capital across projects, while some used risk adjustments for individual projects.

Summary

LO.a: Calculate and interpret the weighted average cost of capital (WACC) of a company.

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

WACC represents the overall cost of capital for the firm and is the appropriate discount rate to use for projects having a similar risk profile as that of the firm.

LO.b: Describe how taxes affect the cost of capital from different capital sources.

In most jurisdictions, interest paid to debt holders are tax deductible, whereas dividends paid to preferred and common stockholders are not tax deductible. To arrive at the after-tax cost of capital, we multiply only the cost of debt by $(1-t)$.

LO.c: Calculate and interpret the cost of debt capital using the yield-to-maturity approach and the debt-rating approach.

Cost of debt is the cost of financing a company using debt instruments. Two methods of estimating the cost of debt are:

YTM approach: It is the annual return that an investor earns if he purchases the bond today and holds it till maturity.

Debt rating approach is used if the market YTM is not available. First estimate the before-tax cost of debt based on comparable bonds with similar ratings and similar maturities. Analyze rated firms with similar financial/valuation characteristics, debt seniority, and security. The company's marginal tax rate is then used to compute the after-tax cost of debt.

LO.d: Calculate and interpret the cost of noncallable, nonconvertible preferred stock.

$$\text{Cost of preferred stock} = \frac{\text{preferred dividend}}{\text{current stock price}}$$

LO.e: Calculate and interpret the cost of equity capital using the capital asset pricing model approach and the bond yield plus risk premium approach.

CAPM:

$$r_e = \text{RFR} + \beta [E(R_{\text{mkt}}) - \text{RFR}]$$

Bond yield plus risk premium:

$$r_e = \text{bond yield} + \text{risk premium}$$

LO.f: Explain and demonstrate beta estimation for public companies, thinly traded public companies, and nonpublic companies.

Beta for a public company is estimated by regressing market returns on stock returns. This is the unadjusted beta. The beta is then adjusted for its mean-reverting value using

$$\text{Adjusted beta} = \frac{2}{3} * \text{unadjusted beta} + \frac{1}{3} * 1.0$$

Beta for thinly traded public companies and nonpublic companies is estimated using a comparable company's beta. It is a four-step process that involves:

- Selecting a benchmark company
- Estimating the benchmark's beta
- Unlevering the benchmark's beta

$$\beta_U = \beta_E \left[\frac{1}{1 + (1 - t) \frac{D}{E}} \right]$$

- Re-levering the beta to reflect the subject company's leverage.

$$\beta'_E = \beta_U \left[1 + (1 - t) \frac{D'}{E'} \right]$$

LO.g: Explain and demonstrate the correct treatment of flotation costs.

Flotation costs are the fees incurred by a company when it raises new capital such as issuing new equity or debt. The correct method to account for flotation costs is to increase a project's initial cash outflow by the flotation cost attributable to the project.