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## Chapter 12

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### Cost of Capital

#### What Is the Cost of Capital?

PLEASE NOTE: This book is currently in draft form; material is not final.

Investors expect a profit. Very few investors would be willing to hand over money if they didn't expect to receive more back! Therefore, each dollar of capital raised by a company has a cost associated with it.

## 12.1 The Cost of Capital Overview

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### LEARNING OBJECTIVES

1. Define the cost of capital.
2. Identify the costs associated with the costs of capital such as flotation, administrative and underwriting.

The **cost of capital**<sup>1</sup> is the rate of return that a firm must supply to its investors. If a corporation doesn't provide enough return, market forces will decrease the prices of their stock and bonds to restore the balance. The cost of capital acts as a link between a firm's long-run and short-run financial decisions because it ties long-run returns with current costs. We should undertake only projects where the return is greater than the associated cost.

### Flotation Costs

**Flotation costs**<sup>2</sup> are the costs of issuing and selling a security. Typical costs include both underwriting and administrative costs. **Administrative costs**<sup>3</sup> are any expenses incurred by the issuer of the security including legal, accounting etc. **Underwriting costs**<sup>4</sup> are payment to investment bankers for selling the security. When we discuss the cost of capital we are discussing the net proceeds from the sale of any security (bond, stock or any other security). So net proceeds are the total amount received minus any of the above described flotation costs.

1. The rate of return a firm must supply to investors.
2. Cost of issuing and selling a security.
3. Any additional costs such as legal, accounting or printing.
4. Payments to the investment banker for issuing the security.

### Components of WACC

There are several components to the cost of capital for a firm. These are:

1. Cost of debt
2. Cost of preferred stock
3. Cost of common stock

Together these three components are then “weighted” based on the percentages they are used in the company.

### KEY TAKEAWAYS

The cost of capital is the return a company must earn on its investment projects to maintain its market value.

- Flotation costs are the costs of issuing a security.
- The components of the cost of capital are 1) debt, 2) preferred stock, 3) common stock.

### EXERCISES

1. What are flotation costs?
2. What are administrative costs?
3. What are underwriting costs?

## 12.2 Cost of Debt

PLEASE NOTE: This book is currently in draft form; material is not final.

### LEARNING OBJECTIVES

1. Understand the components of the cost of debt.
2. Identify the tax implications of debt.
3. Explain how debt plays into the weighted average cost of capital.

The cost of long-term debt,  $r_d$ , is the after-tax cost of raising long-term funds through borrowing. The important cost is our **marginal debt cost**<sup>5</sup> which is the next dollar of debt. If we were to issue another dollar (an additional dollar) of debt, how much would it cost us? The cost of new issuance of debt will probably not be the same as other debt we have issued in the past (our **historical debt cost**<sup>6</sup>), as we will need to satisfy the current market demand.

### How to Calculate the Cost of Debt

There are a few methods to calculate the cost of debt. We are looking for the yield to maturity (YTM), since this is the most accurate gauge of market demand. How do we figure out the yield to maturity? If we have outstanding debt of an appropriate maturity, we can assume the YTM on this debt to be our cost.

If our company, however, has no publicly traded debt, we could look to the market to see what the yield is for other publicly traded debt of similar companies. Or, if we are completely using bank financing, we can simply ask the bank to provide us with an estimated rate.

*Equation 12.1 Pre-Tax Cost of Debt*

**Component Cost of Debt =  $r_d$**

Since interest payments made on debt (the coupon payments paid) are tax deductible by the firm, the interest expense paid on debt reduces the overall tax

5. The cost for the next issue of debt.

6. The cost for debt the company issued in the past.

liability for the company, effectively lowering our cost. To calculate the real cost of debt we take out the tax liability.

*Equation 12.2 After-Tax Cost of Debt*

$$\text{After-Tax Component Cost of Debt} = r_d - (r_d \times T) = r_d \times (1 - T)$$

Here,  $r_d$  is the before tax return and  $T$  is the corporate tax rate.

### Worked Example: Falcons Footwear

Falcons Footwear is a company that produces sneakers for children. Each sneaker has a black and red falcon head on it. Their marginal tax rate is 40%, and they have \$100 million notional, 30 year bonds with a 7% coupon. The bonds currently sell for par. What's the after tax cost of debt?

Since the bonds are selling for par, we know that the YTM equals the coupon rate of 7%.

$$\text{After-Tax Cost of Debt for Falcon Footwear} = 0.07 \times (1 - 0.4)$$

$$= 0.042 \text{ or } 4.2\%$$

#### KEY TAKEAWAYS

The debt component has important considerations.

- Tax considerations are important as interest payments are tax deductible.
- We can estimate the cost of debt either by looking at the market or by looking at our historical debt issuances.

#### EXERCISES

1. What's the cost of debt if the company has \$20 million in 20 year debt that pays 11% and they are in the 40% tax bracket?
2. What's the cost of debt if the company has \$50 million in 10 year debt that pays 6% and they are in the 40% tax bracket?

## 12.3 Cost of Preferred Stock

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### LEARNING OBJECTIVES

1. Understand the components of preferred stock.
2. Explain how preferred stock is a part of the weighted average cost of capital.

Preferred stock dividends are *not* tax deductible to the company who issues them. Preferred stock dividends are paid out of *after-tax cash flows* so there is no tax adjustment for the issuing company.

When investors buy preferred stock they expect to earn a certain return. The return they expect to earn on preferred stock is denoted  $r_{ps}$ .

$D_{ps}$  is the dividend from preferred stock,  $P_{ps}$  is the price of preferred stock.

*Equation 12.3 Cost of Preferred Stock*

$$\text{Component Cost of Preferred Stock} = r_{ps} = \frac{D_{ps}}{P_{ps}}$$

### Worked Example: Falcons Footwear

Falcons Footwear has 2 million shares of preferred stock selling for \$85/share. Its annual dividend is \$7.50. What's the  $r_{ps}$ ?

$$\text{Component Cost of Preferred Stock} = r_{ps} = \frac{\$7.50}{\$85.00} = 0.0882 \text{ or } 8.82\%$$

Typically the cost of preferred stock is higher than the after-tax cost of debt. This is because of both the tax deductibility of interest and the fact that preferred stock is riskier than debt.

### KEY TAKEAWAYS

- Preferred stock is a hybrid security—it's both debt and equity.
- Preferred stock return is calculated as its dividend divided by its price.

### EXERCISES

1. Calculate the component cost of preferred stock given the following: Company A has \$10 million in preferred stock selling for \$100 each and pays a dividend of \$7.80. What's the  $r_{ps}$ ?
2. Why is there no tax-adjustment made to our calculation of preferred stock?

## 12.4 Cost of Common Stock

PLEASE NOTE: This book is currently in draft form; material is not final.

### LEARNING OBJECTIVES

1. Understand the components of common stock.
2. Explain how common stock is a part of the weighted average cost of capital.

New stock issues (IPOs) gain many headlines, as such companies are usually growing fast and require a large influx of capital. Secondary issues don't get as much press, but are also a sign that companies are raising capital. But these are actually **not** the most common way of raising equity financing!

Because dividends are not required to be increased (or even paid!) when a company is doing well, the company can instead retain excess earnings and reinvest them (hence the item on the balance sheet). Most capital is raised through reinvesting earnings, instead of through issuing new stock, because issuing new stock incurs flotation costs. We will assume that the cost to the firm,  $r_s$ , is the same.

The cost of equity is the most difficult source of capital to value properly. We will present three basic methods to calculate  $r_s$ : the Dividend Discount Model (DDM), the Capital Asset Pricing Model (CAPM), and the Debt plus Risk Premium Model (D+RP).

### Using the Dividend Discount Model (DDM)

In [Chapter 10 "Stock Valuation"](#), we explored the DDM model.

*Equation 12.4 Cost of Common Stock*

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

$P_0$  is the price of the share of stock now,  $D_1$  is our expected next dividend,  $r_s$  is the required return on common stock and  $g$  is the growth rate of the dividends of common stock. This model assumes that the value of a share of stock equals the present value of all future dividends (which grow at a constant rate). This equation states that the cost of stock equals the dividend expected at the end of year one divided by the current price (dividend yield) plus the growth rate of the dividend (capital gains yield).

### Worked Example: Falcons Footwear—Constant Growth to calculate $r_s$

Falcons Footwear has 12 million shares of common stock. The stock is currently selling for \$60/share. It pays a dividend of \$3 this year and the dividend is growing at 4%. What is  $r_s$ ?

First we must calculate  $D_1$ .  $D_1 = D_0 \cdot (1+g) = \$3 \cdot (1+0.04) = \$3.12$

$$r_s = \frac{D_1}{P_0} + g = \frac{\$3.12}{\$60} + 0.04 = 0.052 + 0.04 = 0.092 = 9.2\%$$

If our stock isn't currently paying dividends, then the equation reduces to our capital gains yield, which should be proportional to our expected long term growth rate.

### Using the Capital Asset Pricing Model (CAPM)

We learned that the Capital Asset Pricing Model (CAPM) was a relationship between the return for a given stock and the nondiversifiable risk for that stock using beta ( $\beta$ ). The basic equation (from [Chapter 11 "Assessing Risk"](#)) is:

*Equation 12.5 CAPM Equation*

Required return on stock = risk free rate + (market risk premium) \* (Beta of stock)

$$r_s = R_F + [R_M - R_F] \times \beta$$

*Equation 12.6 Market Risk Premium*

market risk premium = expected market return - risk free rate

Where  $R_F$  is the risk free rate,  $R_M$  is the market return or the return on the market portfolio and  $\beta$  is beta. If our company has yet to issue stock, then beta will need to be estimated (perhaps by looking at a public competitor's).

### **Worked Example: Falcons Footwear—CAPM to calculate $r_s$**

Falcons Footwear wants to calculate  $r_s$  using the CAPM. They estimate the risk free rate ( $R_F$ ) to be 4%. The firm's beta is 1.3 and the market return is 9%.

$$r_s = 0.04 + [0.09 - 0.04] * (1.3) = 0.105 = 10.5\%$$

### **Using the Debt plus Risk Premium Model (D+RP)**

If we know that, historically, our stock has traded at a particular premium to our cost of debt, we can use that relationship to estimate our cost of equity. If our stock isn't publically traded, we can estimate based upon competitors or industry averages.

$$r_s = r_d + \text{Risk Premium}$$

### **Worked Example: Falcons Footwear—D+RP to calculate $r_s$**

We know that current Falcons Footwear bonds are yielding 7%. If we know that comparable companies have cost of equity about 4% higher than their cost of debt, what is a good estimate of Falcons Footwear's cost of equity?

$$r_s = 0.07 + 0.04 = 0.11 = 11\%$$

### **Which Method Is Best?**

Each method has its strengths and weaknesses, and all are subject to the quality of the inputs. DDM is very sensitive to the estimation of the growth rate. CAPM depends upon an accurate estimate of the firm's beta. D+RP assumes that the risk premium is accurate.

Often, the best method is to calculate all three results and make an informed judgment based on the results. If one result varies wildly from the other two, perhaps it is best omitted. Estimating the cost of equity is one of the most difficult tasks in finance, and it can end up being equal parts art and science.

### Final Thoughts on $r_s$

1. If a firm's only investors were common stockholders, then the cost of capital would be the required rate of return on equity.
2. The cost of retained earnings is the same as  $r_s$ .
3. Tax implications of common stock are also large. The dividends issued by the company are not tax deductible (just like preferred stock dividends), and the company bears the full cost.

#### KEY TAKEAWAYS

- The cost of common stock can be calculated either using the constant growth model or using CAPM.
- The cost of using retained earnings is assumed to be the same as  $r_s$ .

#### EXERCISES

1. Calculate  $r_s$  using CAPM given the following:

$$R_F = 5\%, R_M = 4\%, b = 1.4$$

2. Calculate  $r_s$  using Constant Growth Model given the following:

$$D_1 = \$5, \text{ Selling price is } \$35, \text{ Dividend is growing at } 2\%.$$

## 12.5 Weighted Average Cost of Capital (WACC)

PLEASE NOTE: This book is currently in draft form; material is not final.

### LEARNING OBJECTIVES

1. Compile the WACC equation.
2. Solve for WACC.

Now that we have calculated all of our component costs, calculating the WACC is simple. We plug into our formula and solve.

Table 12.1 Components of WACC

Variable	=	Definition
$r_d$	=	Interest rate on firm's debt. Or the return on debt.
$r_d(1 - T)$	=	After-tax cost of debt.
$r_{ps}$	=	Return on preferred stock
$r_s$	=	Return on common stock
$w_d$	=	Weight (%) of debt used by company
$w_{ps}$	=	Weight (%) of preferred stock used by company
$w_s$	=	Weight (%) of common stock used by company
WACC	=	Weighted Average Cost of Capital
DPS	=	Dividend of Preferred Stock
P <sub>PS</sub>	=	Price of Preferred Stock
g	=	Growth rate of dividends of common stock
P <sub>0</sub>	=	Price in time zero of a share of common stock
D <sub>0</sub>	=	Dividend in time zero

Variable	=	Definition
D <sub>1</sub>	=	Dividend in time 1

The **weighted average cost of capital (WACC)**<sup>7</sup> takes the return from each component and then appropriately ‘weights’ it based on the percentage used for financing. The weights must sum to one and it is easiest to use decimals. In words the equation is:

*Equation 12.7 WACC components (words)*

$$\text{WACC} = (\% \text{ of debt})(\text{After-tax cost of debt}) + (\% \text{ of preferred stock})(\text{cost of preferred stock}) + (\% \text{ of common stock})(\text{cost of common stock})$$

Or

$$\text{WACC} = (\% \text{ of debt})(\text{Before-tax cost of debt})(1-T) + (\% \text{ of preferred stock})(\text{cost of preferred stock}) + (\% \text{ of common stock})(\text{cost of common stock})$$

Using symbols, the equation is:

*Equation 12.8 WACC components (symbols)*

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

**Worked Example: Falcons Footwear—CAPM to calculate  $r_s$**

Falcons Footwear has 12 million shares of common stock selling for \$60/share. They have 2 million shares of preferred stock selling for \$85/share and \$100 million in bonds trading at par. They are in the 40% tax bracket.

**First we calculate the total market value:**

Total market value of common stock = 12 million\*\$60 each = \$720 million

Total market value of preferred stock = 2 million shares\*\$85 each = \$170 million

Total market value of bonds = \$100 million trading at par = \$100 million

**Total market value = 720 + 170 + 100 = \$990 million**

7. The average of the returns required by equity holders and debt holders, weighted by the company’s relative usage of each.

**From this we get the weights:**

$$\text{Percentage of common stock} = \$720 / \$990 = 72.7\%$$

$$\text{Percentage of preferred stock} = \$170 / \$990 = 17.2\%$$

$$\text{Percentage of debt} = \$100 / \$990 = 10.1\%$$

$$\text{Total equals} = 100\%$$

Then we plug in the weights and the component costs.

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

$$\text{WACC} = (0.101)(0.07)(1-0.4) + (0.172)(0.0882) + (0.727)(0.092)$$

$$\text{WACC} = 0.0042 + 0.0152 + 0.0668 = 0.0862 \text{ or } 8.62\%$$

For Falcons Footwear the WACC is 8.62%.

#### KEY TAKEAWAY

- The Weighted Average Cost of Capital is the component returns multiplied by their respective weights.

## EXERCISES

1. Calculate WACC given the following:

$$r_s = 6 \text{ percent}, r_d = 10\%, r_{ps} = 4\%, w_d = 40\%, w_s = 50\%, w_{ps} = 10\%$$

2. Calculate WACC given the following:

$$r_s = 5.5\%, r_d = 4.5\%, r_{ps} = 7\%, w_d = 35\%, w_s = 45\%, w_{ps} = 20\%$$

## 12.6 WACC and Investment Decisions

PLEASE NOTE: This book is currently in draft form; material is not final.

### LEARNING OBJECTIVES

1. Explain how WACC plays into investment decisions.
2. Avoid common mistakes with WACC.
3. Distinguish between what the firm can and cannot control.

Once we have calculated the WACC, it is vital that it is used properly. Our main objective is to maximize stakeholders' value. Anything that increases shareholder value is good and should be done. From a financial perspective, if the return from a project is greater than its cost, we should undertake the project. If the cost of the project is greater than its expected return, we should not undertake the project. WACC is the cost of the capital used to complete the project and is as such our cost of capital. If the return earned from the project is 12% and our WACC is 10%, the project will add value. If the WACC is 14%, the project destroys value. Thus, if our calculation of WACC is in error, then so are our investment decisions.

### Common Mistakes

In using WACC there are some common pitfalls including:

1. Historical vs. Marginal Rates
2. Book vs. Market Values

### Historical vs. Marginal Rates

It is tempting to assume that the cost for the next dollar of investment will be the same as the cost of the prior investments. If we assume that because our prior debt issue was at 7% interest that our next cost of debt will be 7%, it could significantly affect the WACC. With even bigger numbers, a corporation could grossly underestimate (or overestimate) their costs. Inaccuracy in cost calculation may

result in missed opportunities. We must look to current market conditions to accurately estimate our cost of capital.

### **Book vs. Market Values**

Book values are what a firm purchased something for. Market values are what it is currently worth if it were to be sold in the market. So which should be used in calculating WACC? Market values are the most accurate, especially when considering how widely equity values can vary from their stated book values. As demonstrated in the recent financial crisis, market values can have wide fluctuations but they are still the chosen value.

### **Factors Beyond a Firm's Control**

Certainly having some knowledge about the future would be helpful. Or having some control over certain conditions. There are several factors which are beyond a firm's control. These include:

1. State of financial markets and market conditions
2. Investor's risk aversion
3. Taxes

All of these factors impact a firm's WACC, and yet they have no control over any of them.

### **Factors the Firm Can Control**

There are several factors a firm can control. They are:

1. Capital Structure
2. Dividend Policy
3. Investment Policy

While the firm cannot control certain effects, they are able to make internal decisions about other items.

### **Adjusting WACC for Project Risk**

Not all projects have the same amount of risk. There are many uncertainties with any project, and, all other things being equal, a less risky project is preferable to a

more risky one. Many firms will adjust the discount rate used for NPV analysis (or the hurdle rate for IRR) based upon the perceived risk of the project. If a project has less risk (or offsets existing risk) in the company, a lower discount rate is used; riskier project get a higher rate. These rates can be assigned per division or per project, based upon the granularity that a company desires.

Technically, the risk we should care about most is the project's contribution to our systematic risk (see [Chapter 11 "Assessing Risk"](#)), as risk that is firm (or project) specific can be diversified away by investors. In theory, we could try to estimate a beta for our project and recalculate the WACC! In practice, however, most firms that adjust for risk tend to use judgment to determine the approximate risk of the project, and consequently choose an appropriate discount rate.

### Worked Example: Falcons Footwear—Adjusting WACC for risk

Falcons Footwear has a WACC of 8.62%. Management has decided that a division's projects tend to increase the company's risk, so all projects must be discounted at 2% + WACC. Thus, their projects will be discounted at 10.62%.

#### KEY TAKEAWAYS

A correctly calculated WACC needs to be used properly.

- Avoid common mistakes of using historical and book values.
- Be concerned with those items a firm can control such as capital structure, dividend policy and investment policy.

#### EXERCISES

1. What are the factors a firm can control? What are the factors a firm cannot control?
2. When might we use historical instead of market rates?
3. Might there be a time when it would be appropriate to use book values to calculate WACC?

## 12.7 Bigger Picture

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### LEARNING OBJECTIVES

1. Explain how WACC fits into the larger picture of finance.
2. Discuss the ethics of WACC.

The time value of money is at the heart of finance, and using the appropriate discount rate is essential. WACC gives us that discount rate. Even though most employees in the firm will never need to calculate the WACC, many key decisions will hinge upon the use of WACC in discounting the future cash flows of projects. Keeping WACC low drives stock prices higher (since future income streams become worth more), which is why it is vital not to take undue risk (that is, risk without appropriate return).

A note about non-profit organizations: calculating an appropriate WACC is much more difficult. What is the return desired by our donors? Instead, management will have to select a rate that represents the trade-off between projects now and in the future (the opportunity cost). Some will look toward the for-profit sector to provide examples of WACC, while some rely solely on the judgment of senior management. This will enable comparisons amongst projects competing for the donor's resources.

### Ethical Considerations

Like all methods for computing a result: garbage in means garbage out. Some managers will determine ahead of time the desired outcome for a project, and try to calculate WACC to “tip the scales” on the financial decision. Using a firm-wide WACC can elevate this somewhat, but if the estimate for beta is too low or the wrong YTM on debt is used, the difference can cause a slew of projects to be accepted or rejected. If risk adjusted discount rates are used, managers could misrepresent the true risk of their projects to attempt to have them accepted.

### KEY TAKEAWAYS

- WACC is central to proper discounting for projects.
- Since WACC does potentially leave some room for interpretation, setting firm or division wide rules for WACC before projects are considered can help prevent managers from “tipping the scales”.

### EXERCISES

1. Why should a non-profit entity care about the idea of WACC?
2. Depending upon how you calculate the WACC for your corporation (for example, using DDM vs. CAPM for the equity component), you get a range of outcomes from 9.2% to 10.1%. You know a project that your friend is working on needs a 10% or lower discount rate to be financially profitable. What are some of the factors that should be considered in evaluating the project ethically?

## 12.8 End-of-Chapter Problems

PLEASE NOTE: This book is currently in draft form; material is not final.

### END-OF-CHAPTER EXERCISES

- 1.
- 2.
- 3.
- 4.
- 5.