

FIN401 ADVANCED FINANCIAL MANAGEMENT

NOTE: WEIGHTED AVERAGE COST OF CAPITAL

Introduction

Companies require resources to fund their business. These resources are referred to as **Capital**. Capital is used to acquire the necessary resources, such as inventory, buildings and equipment, and working capital.

There are two primary sources of capital: **Debt** and **Equity**. A company can borrow money through loans or the issuance of bonds or can raise money through the selling of ownership in the company.

For example, after forecasting future results, a company may determine it needs to raise \$10 million to fund its business. It then determines whether to borrow the money (debt) or sell a piece of ownership of the company (equity), or both, to raise the \$10 million. More commonly, it may be a combination of both as each has its advantages and disadvantages.

When a company receives money through either means, it comes at a cost. Debt requires interest payments and equity requires a return to its owners. Whether that return is distributed in the form of dividends or is retained in the company as Retained Earnings, owners expect a return.

Companies need to understand how much their capital costs. They must be able to earn more than their money costs in order to be a viable business. For example, suppose you were given the opportunity to invest in an opportunity that provides a 10% return on your investment (ROI). Because it is a great opportunity, you decide to invest. However, you do not have the funds for the investment. Therefore, you decide to borrow money against your credit card at an 18% interest rate to obtain the needed funds for the investment. This is a losing proposition, of course. You would be borrowing money that costs 18% in order to earn 10%.

Companies, in much the same manner, invest in assets to generate revenue and profits. If the funds that are used to purchase those assets cost more than the profit they generate, it is a losing proposition. Companies, therefore, need to understand their cost of capital in order to manage their business and only invest in opportunities that generate returns that are greater than or equal to their cost of capital.

Weighted Average Cost of Capital (WACC)

The cost of capital for a company is measured as the **Weighted Average Cost of Capital (WACC)**. The term **Cost of Capital** is pretty simple – it is the amount your capital costs, measured in annual terms. For example, if a company has \$10 million in capital and had \$1 million in annual interest expense and another \$0.5M that owners (shareholders) expected in return, the total cost would be \$1.5 million, or a 15% cost of capital (\$1.5 million divided by \$10 million). Cost of Capital can be measured in \$ and as a %; however, it almost always presented as a % - this allows for comparability as well as the ability to measure cost of capital for future forecasts, among other reasons.

The term **Weighted Average** is used to define the cost of capital as a weighted average cost of the Debt Cost of Capital and the Equity Cost of Capital. For example, a student calculating his or her GPA cannot simply calculate the average of the scores of each course but instead must “weight” each course score by the number of credits of the course. A course that is 3 credits will be “weighted” 3 times higher than a course that has only 1 credit.

In much the same way, a company must “weight” its sources of capital. For example, a company that has 25% of its capital in the form of equity and owners require a 20% return, and 75% of its capital in debt with an interest rate of 10%, the WACC would be calculated as follows by multiplying the proportion times the rate (ignoring tax implications):

	<u>Proportion of capital</u>		<u>Rate</u>		<u>Weighted Average Rate</u>
Debt	75%	x	10%	=	7.5%
Equity	25%	x	20%	=	5.0%
WACC					12.5%

Calculating Debt Cost of Capital

The simplest way to calculate a debt cost of capital rate % is to start with the interest % rate of a loan or bond (please note that only debt that incurs interest is included in the calculation – accounts payable and other such payables that don’t incur interest are excluded). If that interest % rate is not known (perhaps in the case of a forecast when the loan has not yet been obtained or bonds not issued), an estimated rate can be calculated by using credit ratings. For our purposes, we will assume that the rate is known.

The next step is to calculate the impact of taxes. This needs to be done as one of the advantages of debt is that interest expense is used as a tax deduction, i.e., taxable income is reduced by the amount of interest expense. For example, a company with a 40% tax rate that has pre-tax income (taxable income) of \$100,000 and no interest expense will incur \$40,000 of tax expense. That same company, if it has a loan of \$100,000 at a 10% interest rate (\$10,000 interest expense), will reduce its taxable income from \$100,000 to \$90,000. Thus, its tax expense will only be \$36,000 (40% x \$90,000). There is a formula that calculates an adjusted interest rate (tax-adjusted rate) as follows:

$$\text{Debt Cost of Capital \%} = (\text{Debt Interest Rate}) \times (1 - \text{tax rate})$$

In the preceding example, it would be calculated as follows:

$$\text{Debt Cost of Capital \%} = 10\% \times (1 - 40\%)$$

$$\text{Debt Cost of Capital \%} = 10\% \times 60\%$$

$$\text{Debt Cost of Capital \%} = 6\%$$

Therefore, the tax-adjusted cost of capital rate for debt is 6% instead of 10%. Let’s check the numbers:

Interest Expense	\$10,000	(\$100,000 x 10%)
Tax Savings	<u>-\$ 4,000</u>	(Taxes of \$36,000 instead of \$40,000)
Adjusted Interest Expense	\$ 6,000	

The adjusted Interest Expense of \$6,000 is 6% of the Loan of \$100,000.

Calculating Equity Cost of Capital

The Equity Cost of Capital can be stated another way: the return that equity investors are expecting for their investment. When an investor buys a piece of ownership in a company, he or she is expecting a return on that investment. Whether the owner receives dividends or not in a particular year is irrelevant – the profit that is not distributed stays on the books as part of the value of the company, which the owner owns.

In some smaller companies, the equity cost of capital can be simply the percentage return that an investor/owner expects. But in most situations, however, equity expected return is calculated using the **Capital Asset Pricing Model (CAPM)**. It is a model used to calculate how capital assets (investments) are priced in the equity market (stock market). In other words, it calculates the return that equity investors are expecting.

Let's start with the formula and then describe the different components. The formula is as follows:

$$\text{Equity Investors Expected Return (CAPM)} = \text{Risk-free Rate} + (\text{Beta} \times \text{Equity Market Risk Premium})$$

The components of the formula are as follows:

1. **Risk-free rate:** this is the rate that investors can earn without any risk. This is the amount that investors should be able to earn no matter what. An investor that sticks his or her cash in a mattress will earn 0%. However, there is a better risk-free rate: Government Treasury Notes or T-bills. These pay low rates, currently in the 2-3% range, but they are better rates than a mattress or a bank deposit. They are considered risk-free because they are guaranteed by the government, who can print more money if necessary. Thus the risk-free rate becomes the new "0" – it is the new baseline starting point for all investments.
2. **Beta:** Beta measures the volatility or risk of the investment in an individual stock and how the stock "tracks" with the stock market as a whole. A stock with a Beta of 1.0 means the volatility of the stock is in sync with the rest of the market (generally the S&P 500 is used as a measure of the market). A Beta of > 1.0 implies that the risk is greater than the market risk as a whole as the stock moves up and down at a rate greater than the rest of the market, whereas a Beta of < 1.0 implies a risk that is smaller than the market as a whole as the stock moves up or down at a rate less than the rest of the market. Of course, a higher beta with higher risk would lead to an expectation of a higher return and a lower Beta with a lower risk would lead to an expectation of a lower return.

Beta also varies depending on the amount of debt a company holds. A company with more debt is considered to be more risky, therefore a highly "levered" beta (i.e., more debt) will have a higher risk. In other words, higher debt leads to a higher Beta and lower debt leads to a lower Beta. In the CAPM formula, the Beta should reflect the debt of the company (i.e., the levered beta should be used).

The formula to calculate an "unlevered" Beta to measure what the Beta of a company would be with no debt is as follows:

$$\text{Unlevered Beta} = (\text{Levered Beta}) / [1 + (1 - \text{tax rate}) \times (\text{Debt/Equity})]$$

The formula to calculate a "levered" Beta to account for the amount of company a debt holds is as follows:

$$\text{Levered Beta} = (\text{Unlevered Beta}) \times [1 + (1 - \text{tax rate}) \times (\text{Debt/Equity})]$$

New York University Stern School of Business measures Betas of different industries and is a good source for Beta calculations:

http://pages.stern.nyu.edu/~adamodar/New_Home_Page/datafile/Betas.html

3. **Equity Market Risk Premium (EMRP):** this is the premium earned for investing in the equity market (stock market). In other words, because one invests in the stock market, he or she will earn more (a premium) than if he or she invested only in T-bills at the risk-free rate. The EMRP is measured as the market rate minus the T-bill rate (S&P rate minus the T-bill rate).

Based on the above definitions, another way of stating the CAPM formula is as follows:

$$\text{CAPM} = \text{T-bill Rate} + (\text{Beta} \times (\text{S\&P 500 rate} - \text{T-bill rate}))$$

One way to understand CAPM is to see it through the eyes of an investor in a few scenarios (in these assumptions, assume that the T-bill rate is 2% and the S&P 500 rate is 12%):

Scenario 1: Investor does not want to take any risk but understands that keeping cash in a mattress is not a good alternative. Therefore, he or she decides to invest only in T-Bills. The expected return would be calculated as follows:

$$\text{CAPM} = 2\% + \text{N/A} = 2\%$$

Scenario 2: Investor decides to take some risk by investing in very low-risk stocks. Let's assume these low-risk stocks would have a Beta 0.5. The expected return would be calculated as follows:

$$\begin{aligned}\text{CAPM} &= 2\% + (0.5 \times (12\% - 2\%)) \\ \text{CAPM} &= 7\%\end{aligned}$$

Scenario 3: Investor decides to take on average risk by investing in average-risk stocks. Let's assume these average-risk stocks would have a Beta 1.0. The expected return would be calculated as follows:

$$\begin{aligned}\text{CAPM} &= 2\% + (1.0 \times (12\% - 2\%)) \\ \text{CAPM} &= 12\%\end{aligned}$$

Scenario 4: Investor decides to take on high risk by investing in very high-risk stocks. Let's assume these high-risk stocks would have a Beta 1.5. The expected return would be calculated as follows:

$$\begin{aligned}\text{CAPM} &= 2\% + (1.5 \times (12\% - 2\%)) \\ \text{CAPM} &= 17\%\end{aligned}$$

As you can see, in Scenario 1, the investor is taking on no risk and therefore has a very low expected return of 2%. In Scenario 2, the investor decides to earn some premium over the risk-free rate for investing in the equity market instead of just T-Bills. But the risk is minimized somewhat by investing only in low-risk stocks so he or she only gets a portion of the premium as the low Beta brings the overall expected return lower. In Scenario 3, the investors decides to invest in average-risk stocks that "track" with the stock market as a whole. Therefore, the expected return is what the S&P return is expected to be. In Scenario 4, the investor decides to earn some premium for investing in the equity market and wants to take on more risk and has a higher Beta. Naturally, with the higher risk comes the higher expected return. Here the Beta makes the expected return higher.

An important point to note for equity cost of capital is that equity distributions (dividends) are **NOT** tax-deductible. Therefore, a tax-adjusted rate for equity is not calculated.

Calculating WACC % Rates

Once a company has calculated its debt cost of capital and equity cost of capital, it requires one more piece of information – the proportion of its capital which is debt and the proportion of its capital which is equity. To do this, a company will calculate its average annual debt and equity over the period of time for which it is calculating WACC.

Average debt is calculated by calculating the average year-end debt for the periods being measured.

Average equity can be measured two ways:

- For companies in which there is not a market value for the stock of the company, equity for the periods being averaged is the equity on the books (stock plus retained earnings).
- For companies in which there is a market value for the stock of the company, equity for the periods being averaged is the market cap (market capitalization, or # of shares x market price of the stock).

Let's look at the calculation of WACC for a company. Let's assume the following information for the company:

- Average debt for the period = \$1,500,000
- Average Stock + Retained Earnings for the Period = \$1,000,000 (Private company without market valuation)
- Income Tax Rate = 40.0%
- Debt Interest Rate = 7.0%
- Calculated CAPM Rate = 14.0%

The calculation would be as follows, with the weighted calculation being the proportion x the tax-adjusted rate:

	<u>Avg Amt</u>	<u>Proportion</u>	<u>Rate</u>	<u>Tax-Adj Rate</u>	<u>Weighted</u>
Debt	\$1,500,000	60%	7.0%	4.2%	2.52%
Equity	\$1,000,000	40%	14.0%	14.0%	5.60%
WACC		100%			8.12%

Summary

Measuring the WACC provides the information a company needs to make financial calculations, including projects to invest in (sometimes WACC is known as the ***hurdle rate***) and calculating the Net Present Value of projects (sometimes WACC is known as the ***discount rate***).

One last point – we often think of a “break-even point” as being the point where revenue and expenses are equal. Understanding WACC allows us to look at a new “break-even point” – the point in which the company has enough revenue to cover not only its expenses, but also its expected return to shareholders.