Video 30 - WACC: Calculating the Costs of Capital

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Welcome back! This video is the second of our two-part series on WACC, the weighted average cost of capital. In Part 1, we learned about what WACC is, how it can be used, and how we can calculate the weights for each component of a firm's capital structure. Now, it is time to learn how to calculate the cost of each of the components.

Video at 00:25

Throughout this video, keep in mind that the cost of capital to the company equals the return required by its debt and equity investors. These two terms are often used interchangeably, depending on whether you take on the perspective of the company or the investors, but both get at the same concept: the "r" in the WACC formula. Recall that

$$WACC = R_D \times \left(\frac{D}{V}\right) + R_P \times \left(\frac{P}{V}\right) + R_E \times \left(\frac{E}{V}\right) = R_D \times w_D + R_P \times w_P + R_E \times w_E$$

Video at 00:44

First is the cost of debt (R_D). There are two ways of estimating the cost of debt: one is using the yield to maturity approach, and the other is using the debt rating approach. *NOTE: for a firm that does not have bonds, the cost of debt = the interest rate on its loans, because loans are a type of debt.*

Video at 00:55

Recall that the yield to maturity is the measure of the return on a bond, assuming that it is held until maturity. This tells us the return that bondholders require to hold this debt until maturity, which is the same as telling us the cost of the firm for owing the bondholder. An effective way of estimating the cost of debt of a firm is to look at the YTM of the bonds that the company issues. Of course, YTM differs according to the term of the bond; so, if possible, choose a bond with the term length or maturity that matches the timing of the project that you were applying WACC to.

Video at 01:28

The other approach is the debt rating approach. This method is used when information on the company's bonds is not available or not applicable. In this case, we would find a comparable

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company that has the same credit rating as the company we are looking at. There are many credit rating agencies out there, such as Moody's, Standard & Poor's, and Fitch Group, who score a company's bonds to tell us how risky the firm's debt is. We use the YTM of that company's bond, with a similar term to maturity as our desired project, to estimate the cost of debt. When using this method, some adjustments might have to be made to the cost of debt to account for differences between the companies. The idea is that, if we can find information on debt that looks similar to the debt of the firm we are interested in, then the cost to borrow this debt should be similar.

Video at 02:16

Next is the cost of preferred stock. Companies usually promise preferred stock owners that they will pay a fixed dividend every year for an unlimited amount of time. This fixed payment can be expressed as a dollar amount or as a percentage of the book value of the preferred share. Because the dividends are promised and have no maturity date, we can use the perpetuity formula to calculate the cost of preferred stock (R_P). Recall that the perpetuity formula is

$$price = PV = \frac{D}{R_P}$$

where "D" represents the fixed dividend, and R_P represents the appropriate discount rate for the preferred share. Notice that this is the same R_P that we want to use in our WACC formula.

Video at 02:54

While R_P is a rate of return for the preferred shareholder, it represents how much it costs the firm to issue these preferred shares to the preferred shareholders. We can rearrange this formula into

$$R_P = \frac{D}{PV} = \frac{D}{share\ price}$$

where "D" is the dividend given per year, and the PV is the current market value (price) of the preferred stock, which can be found on the stock market.

Video at 03:19

Let's try a problem together. Note that, here, you are given Van-cool-ver's capital structure in the form of a debt-to-equity ratio; however on an exam you may be asked to find the values of debt and equity yourself, where debt (D) is the present value of the firm's bond or loans, and equity

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(E) is the market price of the firm's common shares. Pause this video, and try this question yourself. When you are ready, resume the video, and we will go over the answer together.

There's a new company in town, Van-cool-ver, that is a one-stop shop for all the cool Vancouverites, selling everything from athleisure to kombucha to umbrellas. Imagine that Van-cool-ver has 1 million preferred shares outstanding that sell on the market for $120/share and that promises to pay an 8% fixed dividend forever. Van-cool-ver's accountant tells you that, according to their records, the preferred shares have a value of $100 milion. What is the cost of preferred stock for Van-cool-ver?

Video at 03:49

The formula for calculating the cost of preferred stock is

$$R_P = \frac{D}{PV} = \frac{D}{share\ price}$$

"D" is unknown, so we must first solve for the dividends. The company has 1 million shares that have a book value of $100 million, so each share has a book value of

$$book\ value\ per\ preferred\ share = \frac{\$100\ million\ book\ value}{1\ million\ shares\ outstanding} = \$100$$

8% dividends for a $100 share is $8 (0.08*$100). Plug this into the formula:

$$R_P = \frac{\$8}{\$120} = 6.67\%$$

Notice that, for the present value, we use the current market value of the stocks, because this is how much the shares are worth based on the future expected dividends of the preferred shares, as valued by the stock market.

Video at 04:30

Finally, we must calculate the cost of equity (R_E). The main way to calculate the cost of equity is using the capital asset pricing model (CAPM) or, in other words, the SML approach. You should know how to use CAPM to calculate an investor's return on equity. Recall the CAPM formula:

$$CAPM: (R_E) = R_f + \beta \times \left[E(R_m) - R_f\right]$$

Like with the preferred shares, the return on equity for stockholders is also the cost of equity to the company.

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Video at 04:58

Let's do a question together to refresh your memory. Let's check back in with our neighbourhood shop, Van-cool-ver. Pause this video, and try this question yourself. When you are ready, resume the video, and we will go over the answer together.

There's a new company in town, Van-cool-ver, that is a one-stop shop for all the cool Vancouverites, selling everything from athleisure to kombucha to umbrellas. Imagine that Van-cool-ver has a beta of 1.20. After analyzing the market data, you find that the risk-free rate is 2%, and the market return is 8%. What is Van-cool-ver's cost of equity?

Video at 05:22

All the numbers have been given to us, so we can simply plug the numbers in. Here, we have

$$CAPM: R_E = R_f + \beta \times \left[E(R_m) - R_f\right] = 0.02 + 1.20 \times [0.08 - 0.02] \;=\; 9.2\%$$

Video at 05:36

Now that you have learned all the components to calculating WACC, let's revisit Van-cool-ver with a comprehensive question. This is likely what would appear as a long question on an exam. Pause this video, and try this question yourself. When you are ready, resume the video, and we will go over the answer together.

Imagine that Van-cool-ver offers corporate bonds with a YTM of 6.5%, and its equity has a beta of 0.80. The owners of Van-cool-ver tell you that the company has a debt-to-the-equity ratio of 0.70. Finally, from the market, you gather that the risk-free rate is 4%, and the market return is 10%. What is the WACC for Van-cool-ver?

Video at 05:53

Let's go over the answer. Firstly, we can see right away that Van-cool-ver doesn't have any preferred shares, so we can just ignore that component of WACC. Next, let's try to find the weights of debt (w_D) and equity (w_E). This company has a debt-to-equity ratio of 0.7. As we learned in part A of this video ("WACC: Introduction and Calculating the Weights"), we can use the debt-to-equity ratio approach to determine the company's capital structure. We first assume $equity \;=\; E \;=\; 1$ and

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$$debt = D = 0.7 \times E = 0.7(1) = 0.7$$

Add them up to get that the value of total assets, V, is

$$V = D + P + E = 0.7 + 0 + 1 = 1.7$$

Video at 06:24

For the weight of debt (w_D), we find the ratio of debt to value

$$w_D = \frac{D}{V} = \frac{0.7}{1.7} = 41.18\%$$

and the weight of equity

$$w_E = \frac{E}{V} = \frac{1}{1.7} = 58.82\%$$

Always double-check your calculations by making sure your weights add up to 100% (41.18% + 58.82%)

Video at 06:44

Now that we have the weights, the next step is to calculate the cost of debt and the cost of equity. The cost of debt (R_D) is given to you as 6.5%. Applying the CAPM formula, the cost of equity is

$$CAPM: \ R_E = R_f + \beta \times \left[E(R_m) - R_f \right] = 0.04 + 0.80 \times [0.10 - 0.04] = 8.8\%$$

Video at 06:57

Finally, we will plug our numbers into the WACC formula: the resulting WACC should be

$$WACC = R_D \times w_D + R_P \times w_P + R_E \times w_E = 6.5 \times 0.4118 + 0 + 8.8 \times 0.5882 = 7.85\%$$

Thus, this is the appropriate discount rate for this firm that reflects the overall riskiness of how the firm is financed.

Video at 07:13

In the last two videos, we learned about WACC, what it is, and how to use it. We discussed the specific components in more detail, and identified how to calculate the individual weights and the cost of capital. After doing some W(h)ACC(k)-y calculations, I hope that you have a better understanding of WACC. Until next time!

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