

In this spreadsheet we will calculate weighted average cost of capital

We will not stop on detailed explanations and economic meanings of the variables, because there is too much info on that in the web

We will focus on the main steps of WACC calculation and different approaches applicable to each steps

You should know that there is no unique approach to WACC calculation and many analysts create their own approaches and logic for WACC model

WACC

Traditional formula for WACC calculation is:

$$\text{WACC} = W_e \times C_e + W_p \times C_p + W_d \times C_d \times (1 - t)$$

or

$$\text{WACC} = \text{Weight of equity} \times \text{Cost of equity} + \text{Weight of preferred stock} \times \text{Cost of preferred stock} + \text{Weight of debt} \times \text{Cost of debt} \times (1 - \text{tax rate})$$

Let's calculate separately each of the elements in the formula above

$$W_e \text{ (Weight of equity)} = \text{MVC} / (\text{MVC} + \text{MVP} + \text{MVD}) =$$

$$= \text{Market value of common stock} / (\text{Market value of common stock} + \text{Market value of preferred stock} + \text{Market value of debt})$$

$$C_e \text{ (Cost of Equity)} = R_f + B \times (R_m - R_f) = \text{Risk free rate} + \text{Beta} \times (\text{Market return} - \text{Risk free rate}) = \text{Risk free rate} + \text{Beta} \times \text{Equity risk premium}$$

This is one of the most important elements of WACC formula and one of the most difficult for calculation. We'll return to this formula later in "Cost of equity" part

$$W_p \text{ (Weight of preferred stock)} = \text{MVP} / (\text{MVC} + \text{MVP} + \text{MVD}) =$$

$$= \text{Market value of preferred stock} / (\text{Market value of common stock} + \text{Market value of preferred stock} + \text{Market value of debt})$$

$$C_p \text{ (Cost of preferred stocks)} = \text{Div} / \text{Price} = \text{Annual dividend on preferred stock} / \text{Market price of the preferred stock}$$

$$W_d \text{ (Weight of debt)} = \text{MVD} / (\text{MVC} + \text{MVP} + \text{MVD}) =$$

$$= \text{Market value of debt} / (\text{Market value of common stock} + \text{Market value of preferred stock} + \text{Market value of debt})$$

C_d (Cost of debt) = the yield of company's bonds; if the company has no bonds use the rate for company's bank loan; if you have no information on yields or rates but you now that the company has a debt, use the yields of bonds for similar companies' bonds (they should have same size, credit ratings, operate in the same industry, i.e. they should be similar in all possible ways)

t (tax rate) = the rate of corporate income tax in the country where it is registered (where it pays corporate income tax)

Let's also look at the formulas for some of the elements in the formulas above

Market value of common stocks (MVC) = number of common stocks x current market price of common stocks

Market value of preferred stocks (MVP) = number of preferred stocks x current market price of preferred stocks

Market value of debt (MVD) = Market value of the issued bonds; if the company has no bonds, but have bank loans, use their balance value for calculation; if the co

has mixed debt structure, use debt value from its balance sheet (Long-term debt + Short-term debt)

if the company has no debt than the Market value of debt = 0

COST OF EQUITY

Cost of equity is one of the key elements of WACC formula

The classic formula for Cost of equity calculation is

$$C_e \text{ (Cost of Equity)} = R_f + B \times (R_m - R_f) = \text{Risk free rate} + \text{Beta} \times (\text{Market return} - \text{Risk free rate}) = \text{Risk free rate} + \text{Beta} \times \text{Equity risk premium}$$

Let's calculate all the elements from this formula

R_f (Risk free rate) is usually a yield for government's 10 year bonds. In USA the yield of Treasury notes is usually used while for European countries you can use 10 years Gerr. Some analysts use current 10Y rates (for US 10Y notes it is about 2.9% now, in Dec 2010), some prefer average historical values, some use forecast for 10Y notes yields

When analysts calculate cash flows not in \$ or €, but in some local currency, many of them use local government's 10 years bonds yield nominated in local currency

If there is no such long-term debts available, you can use the rate for borrowings of the most reliable and safest company in the country nominated in local currency

Many economists still argue on the definition of the risk free rate, because some Emerging Markets countries defaulted on their debts in the past (for example Russia, Argent

Thus we can not consider the yields of their bonds as a risk free rate in a classic / traditional interpretation.

Anyway, you can choose the approach which is more suitable for you and which you consider logical for your situation

More on calculation of the risk free rate you can find on Aswath Damodaran's page

<http://pages.stern.nyu.edu/~adamodar/pdfiles/papers/riskfree.pdf>

B (Beta) calculation

Beta describes the relation of returns between the stock and the market.

The formula for Beta is

$$\text{Beta} = \text{Cov} (R_s; R_m) / \text{Var} (R_m)$$

$\text{Cov} (R_s; R_m)$ is the covariance of the stock's and market's returns

You can calculate covariance using COVAR function in excel (if you are interested you can also look at the definition of covariance in excel)

$\text{Var} (R_m)$ is the dispersion of market returns

You can calculate Var using VAR function in excel

Let's explain this step by step

First download the daily values of the market index and the stock prices in two columns. Download the data for 1,2,3 or more years

After that calculate daily returns for the index and for the stock

After that use COVAR and VAR excel functions to calculate Beta

The example of calculations in details you will find in "example" file

Rm (Market return)

Market return is usually calculated as an average historical return of the country's index
Usually analysts use 30 years history...or 50...That is for you to decide
For US stock market I see Rm between 4% and 5.5% more often

Some stock exchanges on Emerging Markets have a very short history.
In this case you can simply add Country Risk Premium to the historical return of a mature market (well it's actually US stock market)

More on calculation of the country risk premiums, as well as particular rates, you can find on Aswath Damodaran's page:
http://pages.stern.nyu.edu/~adamodar/New_Home_Page/datafile/ctryprem.html

For example, let's calculate Rm for Cuba
We have 5% market return in US and 11.25% country risk premium for Cuba (see the link above), so Rm for Cuba = 5% + 11.25% = 16.25%

Now we can calculate the basic cost of equity.

Some analysts find this calculation not sufficient and add different premiums to the basic cost of equity
For example, one of the most widely used premiums is liquidity premium
Analysts add 0.5-3% liquidity premium to incorporate the risk of inability to sell the stock immediately
You can add premiums for poor transparency, weak corporate governance, risk of shareholders conflict etc

Although some certain mathematical approaches to calculation of these premiums exist, many analysts often simply use their judgments

COST OF DEBT

When you determine the cost of debt for the company you simply try to find at which rate the company is able to borrow money

If the company has publicly traded bonds, your task is very easy - just use the yield of this bond as a cost of debt
Note: cost of debt (rate) should be calculated for the debt nominated in the same currency as your DCF-model (Discount Cash Flows model)
If you calculate your DCF-model in dollars, use dollar nominated bonds' yield

If the company has no traded debt - try to find similar company with publicly traded debt. You are lucky if you find a company of a similar size with the same rating as yours. Use this company's debt yield as your cost of debt
If it has no rating, continue searching for a similar company with publicly traded bonds.

The company should be similar in the structure of the capital, in size, it should be from the same industry

If the company has a debt in form of a bank loan, try to find the info on the rates on this loan in company's reports (financial statements, MD&A, SEC filings)
The bank loan is usually more expensive than bonds so you can make an adjustment if you want
If the company does not disclose the info on its rates, search this info on banks web sites, maybe ask your friends who work in bank about the possible loan rate for your com

In the separate excel files you can find examples of WACC calculation for different companies

EXAMPLE 1. For US incorporated company

We calculate WACC for ConocoPhillips

EXAMPLE 2. For non-US incorporated company

We calculate WACC for Brazilian Petrobras