
MGT-482 Principles of Finance

Assignment 8

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1 Exercice 1

Following answer document shows the formulas used for the computations. All numerical calculations have been carried out in the Excel sheet.

In order to estimate the value of the firm with the WACC using the DCF approach, we will go through three main steps. First, we will compute the r_{WACC} , then the free cash flow and finally the terminal value. Let's compute r_{WACC} using the bottom-up approach as discussed in the lecture. The following formal determines β_U of each firm i .

$$\beta_{U,i} = \frac{\beta_{E,i} + (1 - \tau) \cdot \beta_{D,i} \cdot D_i / E_i}{1 + (1 - \tau) \cdot D_i / E_i} \quad (1)$$

The total β_U is then obtained summing up $\beta_{U,i}$ of each firm taking the weight into account. We have

$$\beta_U = \sum_i w_i \cdot \beta_{U,i} = \sum_i w_i \cdot \frac{\beta_{E,i} + (1 - \tau) \cdot \beta_{D,i} \cdot D_i / E_i}{1 + (1 - \tau) \cdot D_i / E_i} \quad (2)$$

with $\beta_{D,i} = 0$ for all firms. Following relation converts β_U to β_L :

$$\beta_L = \beta_U + (1 - \tau) \cdot (\beta_U - \beta_D) \cdot D / E \quad (3)$$

It is now simple to determine the cost of equity, dept and r_{WACC} .

$$\begin{aligned} \text{Equity} &= E(R_E) = R_F + \beta_L \cdot [E(R_M) - R_F] \\ \text{Dept} &= \text{After tax cost} = (R_F + \text{def. spread}) \cdot (1 - \tau) \\ r_{WACC} &= R_E \cdot \left(1 - \frac{\text{Dept}}{\text{Dept} + \text{Equity}}\right) + R_D \cdot \frac{\text{Dept}}{\text{Dept} + \text{Equity}} \end{aligned} \quad (4)$$

Now we can determine the free cash flows. The $EBIT_i$ for each year i is calculated as follows

$$EBIT_i = \text{growth rate}_i \cdot EBIT_{i-1} \quad (5)$$

We took into account the tax of 35% to determine the after tax $EBIT_i$. The depreciation follows the same behavior than the $EBIT_i$. Finally, we can compute the working capital as follows

$$WC_i = EBIT_i \cdot 10\% \quad (6)$$

The free cash flow (FCF) is determined as follows

$$FCF_i = EBIT(1 - \tau)_i - CAPEX_i + Depreciation_i - \Delta WC_i \quad (7)$$

with

$$CAPEX_i = EBIT(1 - \tau)_i \cdot \text{Reinvestment rate}_i + Depreciation_i - \Delta WC_i \quad (8)$$

Finally, we can compute the present value of each year as follows, with y the year number.

$$PV = \frac{FCF}{(1 + WACC)^y} \quad (9)$$

The terminal value at year 10 can be obtained with

$$\text{Terminal value} = \frac{FCF_{11}}{r_{WACC,10} - g_{10}} \quad (10)$$

Once all data has been entered in the Excel file, we found a value of the firm of **\$50'174.8** with the fixed 10% leverage ratio value. In order to find the value maximizing capital structure, we simply used the Solver add-in of Excel and found an optimal leverage ratio value of **24.99%** leading to a firm value of **\$54'910.3**.