

Question on the cost of capital

World-Wide Enterprises (WWE) is planning to enter into a new line of business (widget industry). American Widgets (AW) is a firm in the widget industry.

	WWE	AW
D/E	1/3	2/3
r_D	10%	12%
β_E	?	1.5

Assume $r_f=8\%$, $T_C=40\%$, Market risk premium=8.5%

What is the appropriate discount rate for WWE to use for its widget venture?

Solution

Four steps to calculate discount rates:

1. Determine AW's cost of equity capital (r_E)
2. Determine AW's hypothetical all-equity cost of capital (r_A)
3. Determine r_E for WWE's widget venture
4. Determine WACC for WWE's widget venture

Let's look at our case.

1. Determining AW's cost of equity capital (r_E) from the CAPM

$$r_E = r_f + \beta \times MRP = 8\% + 1.5 \times 8.5\% = 20.75\%$$

2. Determining AW's all-equity cost of capital (r_A)

$$r_E = r_A + \frac{D}{E}(1 - T_C)(r_A - r_D)$$

$$0.2075 = r_A + \frac{2}{3}(1 - 0.4)(r_A - 0.12)$$

$$r_A = 18.25\%$$

3. Determining r_s for WWE's widget venture

$$\begin{aligned} r_E &= r_A + \frac{D}{E}(1 - T_C)(r_A - r_D) \\ &= 0.1825 + \frac{1}{3}(0.6)(0.1825 - 0.1) = 0.199 \end{aligned}$$

4. Determining WACC for WWE's widget venture

$$\begin{aligned} r_{WACC} &= \frac{E}{E + D}r_E + \frac{D}{E + D}r_d(1 - T_C) \\ &= \frac{3}{4} \times 0.199 + \frac{1}{4} \times 0.1 \times 0.6 = 16.425\% \end{aligned}$$

Bonus formula:

A way of combining steps 3 and 4:

$$\begin{aligned} r_{WACC} &= r_A \times \left(1 - \frac{D}{E + D} T_C \right) \\ r_{WACC} &= 18.25(1 - 0.25 \times 0.4) = 16.425 \end{aligned}$$