

The next issue is what value to use for the risk-free interest rate. By December 2014, the U.S. Federal Reserve Board had pushed down Treasury bill rates to .03%. The one-year interest rate was a little higher, at .15%. Yields on longer-maturity U.S. Treasury bonds were higher still, at about 2.6% on 20-year bonds.

The CAPM is a short-term model. It works period by period and calls for a short-term interest rate. But could a .03% three-month risk-free rate give the right discount rate for cash flows 10 or 20 years in the future? Well, now that you mention it, probably not.

Financial managers muddle through this problem in one of two ways. The first way simply uses a long-term risk-free rate in the CAPM formula. If this short-cut is used, then the market risk premium must be restated as the average difference between market returns and returns on long-term Treasuries.¹⁰

The second way retains the usual definition of the market risk premium as the difference between market returns and returns on short-term Treasury bill rates. But now you have to forecast the expected return from holding Treasury bills over the life of the project. In Chapter 3 we observed that investors require a risk premium for holding long-term bonds rather than bills. Table 7.1 showed that over the past century this risk premium has averaged about 1.5%. So to get a rough but reasonable estimate of the expected long-term return from investing in Treasury bills, we need to subtract 1.5% from the current yield on long-term bonds. In our example

$$\begin{aligned}\text{Expected long-term return from bills} &= \text{yield on long-term bonds} - 1.5\% \\ &= 2.6 - 1.5 = 1.1\%\end{aligned}$$

This is a plausible estimate of the expected average future return on Treasury bills. We therefore use this rate in our example.

Returning to our Union Pacific example, suppose you decide to use a market risk premium of 7%. Then the resulting estimate for Union Pacific's cost of equity is about 9.8%:

$$\begin{aligned}\text{Cost of equity} &= \text{expected return} = r_f + \beta(r_m - r_f) \\ &= 1.1 + 1.24 \times 7.0 = 9.8\%\end{aligned}$$

Union Pacific's After-Tax Weighted-Average Cost of Capital

Now you can calculate Union Pacific's after-tax WACC at the end of 2014. The company's cost of debt was about 4.2%. With a 35% corporate tax rate, the after-tax cost of debt was $r_D(1 - T_C) = 4.2 \times (1 - .35) = 2.7\%$. The ratio of debt to overall company value was $D/V = 9.4\%$. Therefore

$$\begin{aligned}\text{After-tax WACC} &= (1 - T_C)r_D D/V + r_E E/V \\ &= (1 - .35) \times 4.2 \times .094 + 9.8 \times .906 = 9.1\%\end{aligned}$$

Union Pacific should set its overall cost of capital to 9.1%, assuming that its CFO agrees with our estimates.

¹⁰This approach gives a security market line with a higher intercept and a lower market risk premium. Using a "flatter" security market line is perhaps a better match to the historical evidence, which shows that the slope of average returns against beta is not as steeply upward-sloping as the CAPM predicts. See Figures 8.8 and 8.9.