TRW has two primary businesses, automotive components and aerospace manufacturing. TRW’s assets have a total market value of $13 billion of which 50% are automotive assets and 50% are aerospace assets. The beta for the automotive assets is 1.0 and TRW's equity beta is 1.5. TRW’s only liability is $6.5 billion of long-term debt with a beta of 0.3.

(a) What is TRW's overall asset beta?

(b) Northrop Gruman Corp. is interested in purchasing TRW’s aerospace assets. What discount rate should Northrop Gruman use to value the cashflows generated by these assets? Assume the risk-free rate is 5% and the market risk premium is 8.5%.

(c) Suppose that TRW decides to undertake a leverage increasing transaction whereby they issue additional debt and use all of the proceeds to repurchase common stock. What will happen to the beta of TRW’s aerospace assets (decrease, increase, stay the same, uncertain)? Please explain.

Solution

(a) TRW’s overall asset beta must equal the weighted average of the debt and equity betas:

\[
\beta_{\text{Assets}} = \frac{\text{Debt}}{\text{Debt} + \text{Equity}} \cdot \beta_{\text{Debt}} + \frac{\text{Equity}}{\text{Debt} + \text{Equity}} \cdot \beta_{\text{Equity}} = \frac{6.5}{13} \cdot 0.3 + \frac{6.5}{13} \cdot 1.5 = 0.9
\]

(b) To determine the appropriate discount rate for TRW’s aerospace assets, we must first calculate the aerospace beta. Because the overall asset beta is the value-weighed average of the individual betas, the following equation must hold:

\[
\beta_{\text{Assets}} = 0.5 \cdot \beta_{\text{Auto}} + 0.5 \cdot \beta_{\text{Aero}}
\]

\[
0.9 = 0.5 \cdot 1 + 0.5 \cdot \beta_{\text{Aero}} \Rightarrow \beta_{\text{Aero}} = 0.8
\]

Substituting into the CAPM gives the appropriate discount rate:

\[
E(R) = 0.05 + 0.085 \cdot \beta_{\text{Aero}} = 0.05 + 0.085 \cdot 0.8 = 11.8\%
\]

(c) Increasing debt and decreasing equity by repurchasing shares will not affect have any effect on TRW’s assets. Since the assets remain the same, the asset betas (Aerospace and Automotive) will not change. It is the equity beta, and possibly the debt beta, that will be affected by the change in TRW’s capital structure.
Asset and Equity Betas: Complicated Version

You are the CFO of a major firm with two divisions, one in the alcoholic beverage industry and one in the “fast” food industry. You are considering selling (“spinning off”) the fast food division. 85% of the assets of your firm are in the alcoholic beverages industry and the rest in the food service industry. The beta of your firm’s equity is 0.21, the firm’s debt is riskfree, and the debt to equity ratio is 1.09. The expected excess return on the market is 6% and the risk free rate is 3%.

The expected cash flows from the food division are as follows: The division needs to be restructured and requires investment of $200 million both in year 1 and in year 2. In year 3 the food service division is expected to have a cash flow of $100 million which is expected to grow at 2% per year after that forever.

The purpose of this question is to determine the value of the food service division which will be the price for which you can sell the division.

Note: The valuation will be done under two alternative assumptions about the information available to you. In part (a) use only the information from part (a) and not from part (b) and vice versa.

(a) Suppose for this part that you have the following information about a comparable firm, FAST, which is in the fast food industry, FAST’s debt is riskless and FAST has a debt to equity ratio of 0.9 and a beta of equity of 0.78. Compute the value of your firm’s food service division given this information.

(b) Suppose that you do not have any information about comparable firms in the food service industry but you have information about DRINK, a firm in the alcoholic beverage industry. DRINK’s equity beta is 0.07. DRINK’s debt has an expected return of 3% and the debt to equity ratio is 1.6. Compute the value of your firm’s division given this information.

(c) After the food service division has been sold, the capital structure of the remainder of your firm will have a debt to value ratio of 60% but the debt will remain riskless. Using this information and the information from part (b), what will be the beta of equity of your firm after the spinoff?

Solution

(a) FAST’s asset beta is the beta of assets in the food service industry. FAST’s debt to value ratio is

\[
\frac{D}{V} = \frac{D}{D + E} = \frac{D}{\frac{D}{E} + 1} = 0.9 \cdot 1.9 = 0.474
\]

FAST’s debt is riskless and hence the beta of its debt is zero. The asset beta is:

\[
\beta_{Assets} = \frac{Debt}{Debt + Equity} \cdot \beta_{Debt} + \frac{Equity}{Debt + Equity} \cdot \beta_{Equity} = 0.474 \cdot 0 + 0.526 \cdot 0.78 = 0.41
\]

The required return on assets in the food service industry is therefore:

\[
E(R_A) = R_f + \beta_A \cdot (E(R_m) - R_f) = 0.03 + 0.41 \cdot 0.06 = 5.46\%
\]
Using this discount rate, we can now calculate the NPV of the cash flows, giving us the value of the division:

\[
NPV = -\frac{200}{1.0546} - \frac{200}{1.0546^2} + \frac{1}{1.0546^2} \cdot \left( \frac{100}{5.46\% - 2\%} \right) = $2.23 billion
\]

(b) First, we can use the information about DRINK to compute the beta of the assets in the alcoholic beverage industry. Second, we will use the information about your firm to compute the beta of your firm’s overall assets. Finally, we will use the fact that your firm is composed of a portfolio of assets in the alcoholic beverage industry and fast food industry to determine the beta of the assets in the food service industry.

For DRINK we have:

\[
\frac{D}{V} = \frac{\frac{D}{E}}{1 + \frac{D}{E}} = \frac{1.6}{2.6} = 61.5\%
\]

Thus:

\[
\beta_{Assets} = \frac{\text{Debt}}{\text{Debt} + \text{Equity}} \cdot \beta_{Debt} + \frac{\text{Equity}}{\text{Debt} + \text{Equity}} \cdot \beta_{Equity} = 0.615 \cdot 0 + 0.385 \cdot 0.07 = 0.027
\]

For your firm we have:

\[
\frac{D}{V} = \frac{\frac{D}{E}}{1 + \frac{D}{E}} = \frac{1.09}{2.09} = 52.2\% \text{ so } \beta_{Assets} = 0.522 \cdot 0 + 0.478 \cdot 0.21 = 0.1
\]

Thus:

\[
\beta_{Assets} = 85\% \cdot \beta_{A,Alcohol} + 15\% \cdot \beta_{A,Food} = 85\% \cdot 0.027 + 15\% \cdot 0.1 \Rightarrow \beta_{A,Food} = 0.514
\]

Using \( R_A = 3\% + 0.514 \cdot 6\% = 6.08\% \) we can calculate the NPV of the cash flows:

\[
NPV = -\frac{200}{1.0608} - \frac{200}{1.0608^2} + \frac{1}{1.0608^2} \cdot \left( \frac{100}{6.08\% - 2\%} \right) = $1.81 billion
\]

(c) After the spinoff, all your firm’s assets are in the alcoholic beverage industry, so

\[
\beta_A = 0.027 = 40\% \cdot \beta_E + 60\% \cdot 0 \Rightarrow \beta_E = \frac{0.027}{0.4} = 0.067
\]