Corporate Finance, Module 8: "Capital Budgeting and Risk" (Chapter 9)

Homework Assignments (The final exam asks questions similar to this problem.)

(The attached PDF file has better formatting.)

>> put second exercise in later module

Exercise 8.1: Project Choice

Suppose the risk-free rate is 8% per annum, and the market risk premium is 7%. A firm has an opportunity cost of capital of 15% per annum, and it has four potential projects:

Project	Expected Return	Beta
Project #1	12%	0.5
Project #2	13%	0.8
Project #3	18%	1.2
Project #4	19%	1.6

A. If the firm evaluates all projects at a 15% hurdle rate, which projects would it accept? (The firm's opportunity cost of capital is 15%, and we might be tempted to accept projects that exceed the firm's opportunity cost of capital.)
B. If the firm evaluates each project at its risk adjusted discount rate, which projects should be accepted? (Work out each project's opportunity cost of capital by its own beta. Why is the firm's own risk adjusted discount rate not the relevant criterion?)

Question: This homework assignment shows that we cannot judge a project's acceptability by the beta of the firm doing the project; we must use the beta of the project itself. Does this make sense? We estimate betas from stock returns, and we have returns for firms, not for projects. We estimate the beta for ABC Insurance Company, not for auto insurance or term life insurance. How do we know the beta of the project?

Answer: Suppose a firm runs a newspaper, a ratio station, a cable TV station, and a movie studio. For the beta of the newspaper, it examines the returns of newspaper companies; for the beta of the movie studio, it examines the returns of movie studios. The beta of a project is estimated as the beta of firms that engage only in that type of project. For this firm, newspapers and ratio stations have relatively steady earnings that don't depend much on the economy, so their betas are low; movie studios have erratic earnings that depend more on the economy, so its beta is high.

Question: An insurer sells commercial property insurance and workers' compensation. Commercial property has highly erratic losses with high catastrophe potential: hurricanes and terrorism are examples. Workers' compensation has steady profits or losses, since payment amounts and schedules are mandated by the state. Commercial property has the more erratic losses and the higher beta.

Answer: Commercial property has more erratic losses and greater catastrophe potential. This is unique risk, not systematic risk, and it does not affect the beta. The beta depends on systematic risk, such as the risk of common stocks. Workers' compensation has a high ratio of assets to premium, since its reserves stay on the books for many years; commercial property has a low ratio of assets to premium. If the insurer has 20% of its assets in common stock, a five to one ratio of assets to equity for workers' compensation, and a one to one ratio of assets to equity for commercial property, the beta for workers' compensation may be higher than the beta for commercial property.

Question: Are you saying that the beta is higher for workers' compensation?

Answer: We don't know which line has the higher beta. We can't look at unique risk (such as catastrophe risk) to estimate the beta, but we don't know what constitutes systematic risk for insurance operations.

Question: Few insurers sell a single line of business. Many large, publicly traded insurers sell auto insurance, Homeowners, life insurance, health insurance, workers' compensation, and other lines of business. If we use only monoline insurers, we ignore most of the data.

Answer: That is correct. Some financial economists use multiple regression to solve for the betas of each line of business, by using the percentage that each line forms of the insurer's operations. The multiple regression is not a perfect solution, since insurers differ many ways. It is not easy to estimate the beta of a project.

Exercise 8.2: Weighted Average Cost of Capital

A firm has 500,000 shares selling at $48 per share with a beta of 1.400. The firm has debt outstanding with 8% annual coupons, 7 years left to maturity, and $6 million of par value. The debt now yields 10% per annum, and it has a beta of 0.100.

A. What is the market value of the firm's debt? Use the annual coupon rate (8%), the time left to maturity (7 years), the par value ($6 million), and the yield to maturity (10%). (Determine the cash flows for each of the seven years from the coupon rate and the par value, and use the yield to maturity to take the present value. Use either discount factors or the annuity formula to determine the present value.)
B. What is the market value of the firm's equity? (Use the market value per share and number of shares.)
C. Given the market values of the debt and the equity, and the betas of the debt and the equity given in the problem, what is the beta of the firm's assets? (The assets equal the equity plus the debt, so the beta of assets is the weighted average of the beta of equity and the beta of debt, where the weights are the market values of each.)

Question: In practice, do we work out the market value of the firm's debt by the reasoning in Part A of this homework assignment?

Answer: In practice, we know the market value of the debt from the bond markets. Bonds are publicly traded, so the market value is known. The cash flows of the debt are the coupons and the principal repayment, which are also known. We work out the yield to maturity. The yield is given in this homework assignment; in practice, it must be inferred.

Question: Why doesn't the homework assignment give the market value and derive the yield to maturity?

Answer: We can't derive the yield to maturity by pencil and paper. We use a financial calculator or a spreadsheet.

(The following dialogue is from the discussion forum questions:)

Question: Suppose two firms sell the same product. They both issue 30 year debt for $100 million par value with 8% coupons. The coupon rate is for B++ corporate bonds.

Over the next five years, Firm Y suffers an uninsured hurricane loss. It loses much of its assets and bond analysts downgrade the debt. It now has a market value of $90 million.

Firm Z found oil on undeveloped land that it owns. It sells the land and holds the cash in the bank to guard against unforeseen losses that might arise. Bond analysts upgrade the debt, and its market value is now $110 million.

The yield to maturity is lower on Firm Y's debt than on Firm Z's debt. When the yield on the debt decreases, the market value of the debt increases.

From the logic in the textbook, Firm Z is more risky and Firm Y is less risky. But just the opposite is true: Firm Y is more risky, since it might go bankrupt. This extra risk is the reason that bond analysts downgraded the debt.

Answer: You are confusing the discount rate with the expected cash flows.

! If two bonds have the same cash flows, the bond with the higher discount rate has the lower market value.
! If two bonds have the same discount rate, the bond with the lower cash flows has the lower market value.

Firms Y and Z have similar operations and the same discount rate. Firm Y is weak; it may go bankrupt and not pay the coupons or the principal. We use the expected cash flows, not the state cash flows, for the financial analysis.

Question: It seems that the beta of the stock depends on the covariance of the stock returns with the overall market returns, whereas the beta of the debt depends on defaults.

Answer: Some financial economists, like Brealey and Myers, use betas to speak of the expected return on the debt. Others use betas for stocks, not for bonds.