CHAPTER 4

Problems and Questions

In the problems below, use 5.5% as your market risk premium where none is specified.

1. In December 1995, Boise Cascade's stock had a beta of 0.95. The Treasury bill rate at the time was 5.8 percent, and the Treasury bond rate was 6.4 percent. The firm had debt outstanding of $1.7 billion and a market value of equity of $1.5 billion; the corporate marginal tax rate was 36 percent.

a. Estimate the expected return on the stock for a short-term investor in the company.

b. Estimate the expected return on the stock for a long-term investor in the company.

c. Estimate the cost of equity for the company.

2. Boise Cascade also had debt outstanding of $1.7 billion and a market value of equity of $1.5 billion; the corporate marginal tax rate was 36 percent. <AQ: Question 2 is a repeat of the info for question 1. Couldn't parts a and be become d and e of question 1 instead? No new information introduced here. Leave as is>

a. Assuming that the current beta of 0.95 for the stock is a reasonable one, estimate the unlevered beta for the company.

b. How much of the risk in the company can be attributed to business risk and how much to financial leverage risk?

3. Biogen, a biotechnology firm, had a beta of 1.70 in 1995. It had no debt outstanding at the end of that year.

a. Estimate the cost of equity for Biogen, if the Treasury bond rate is 6.4 percent.

b. What effect will an increase in long-term bond rates to 7.5 percent have on Biogen's cost of equity?

c. How much of Biogen's risk can be attributed to business risk?

4. Genting Berhad is a Malaysian conglomerate with holdings in plantations and tourist resorts. The beta estimated for the firm, relative to the Malaysian stock exchange, is 1.15, and the long-term government borrowing rate in Malaysia is 11.5 percent.

a. Estimate the expected return on the stock.

b. If you were an international investor, what concerns (if any) would you have about using the beta estimated relative to the Malaysian index? If you do, how would you modify the beta?

5. You have just done a regression of monthly stock returns of HeavyTech, a manufacturer of heavy machinery, on monthly market returns over the past five years and come up with the following regression:

$$R_{HeavyTech} = 0.5\% + 1.2R_M$$

The variance of the stock is 50 percent, and the variance of the market is 20 percent. The current Treasure bill rate is 3 percent (it was 5 percent one year ago). The stock is currently selling for $50, down $4 over the past year, and has paid a dividend of $2 during the past year and expects to pay a dividend of $2.50 over the next year. The NYSE composite has gone down 8 percent over the past year, with a dividend yield of 3 percent. HeavyTech has a tax rate of 40 percent.

  a. What is the expected return on HeavyTech over the next year?

  b. What would you expect HeavyTech's price to be one year from today?

  c. What would you have expected HeavyTech's stock returns to be over the past year?

  d. What were the actual returns on HeavyTech over the past year?

  e. HeavyTech has $100 million in equity and $50 million in debt. It plans to issue $50 million in new equity and retire $50 million in debt. Estimate the new beta.

6. Safecorp, which owns and operates grocery stores across the United States, currently has $50 million in debt and $100 million in equity outstanding. Its stock has a beta of 1.2. It is planning a leveraged buyout, where it will increase its debt/equity ratio of 8. If the tax rate is 40 percent, what will the beta of the equity in the firm be after the leveraged buyout?

7. Novell, which had a market value of equity of $2 billion and a beta of 1.50, announced that it was acquiring WordPerfect, which had a market value of equity of $1 billion and a beta of 1.30. Neither firm had any debt in its financial structure at the time of the acquisition, and the corporate tax rate was 40 percent.

  a. Estimate the beta for Novell after the acquisition, assuming that the entire acquisition was financed with equity.

  b. Assume that Novell had to borrow the $1 billion to acquire WordPerfect. Estimate the beta after the acquisition.

8. You are analyzing the beta for Hewlett Packard and have broken down the company into four broad business groups, with market values and betas for each group.

Business Group	Market Value of Equity	Beta
Mainframes	$2.0 billion	1.10
Personal computers	2.0 billion	1.50
Software	1.0 billion	2.00
Printers	3.0 billion	1.00

    a. Estimate the beta for Hewlett Packard as a company. Is this beta going to be equal to the beta estimated by regressing past returns on their stock against a market index. Why or why not?

    b. If the Treasury bond rate is 7.5 percent, estimate the cost of equity for Hewlett Packard. Estimate the cost of equity for each division. Which cost of equity would you use to value the printer division?

    c. Assume that HP divests itself of the mainframe business and pays the cash out as a dividend. Estimate the beta for HP after the divestiture. (HP had $1 billion in debt outstanding.)

9. The following table summarizes the percentage changes in operating income, percentage changes in revenue ,and betas for four pharmaceutical firms.

Firm	% Change in Rev	% Change in Operating In	Beta
PharmaCorp	27%	25%	1.00
SynerCorp	25%	32%	1.15
BioMed	23%	36%	1.30
Safemed	21%	40%	1.40

    a. Calculate the degree of operating leverage for each of these firms.

    b. Use the operating leverage to explain why these firms have different betas.

10. A prominent beta estimation service reports the beta of Comcast Corporation, a major cable TV operator, to be 1.45. The service claims to use weekly returns on the stock over the prior five years and the NYSE composite as the market index to estimate betas. You replicate the regression using weekly returns over the same period and arrive at a beta estimate of 1.60. How would you reconcile the two estimates?

11. Battle Mountain is a mining company that mines gold, silver, and copper in mines in South America, Africa, and Australia. The beta for the stock is estimated to be 0.30. Given the volatility in commodity prices, how would you explain the low beta?

12. You have collected returns on AnaDone , a large diversified manufacturing firm, and the NYSE index for five years:

Year	Returns (%) for AnaDone	Returns (%) for NYSE
1981	10%	5%
1982	5%	15%
1983	–5%	8%
1984	20%	12%
1985	–5%	–5%

a. Estimate the intercept (alpha) and slope (beta) of the regression.

b. If you bought stock in AnaDone today, how much would you expect to make as a return over the next year? (The six-month Treasure bill rate is 6 percent.)

c. Looking back over the past five years, how would you evaluate AnaDone's performance relative to the market?

d. Assume now that you are an undiversified investor and that you have all of your money invested in AnaDone. What would be a good measure of the risk that you are taking on? How much of this risk would you be able to eliminate if you *diversify*?

e. AnaDone is planning to sell off one of its divisions. The division under consideration has assets which comprise half of the book value of AnaDone and 20 percent of the market value. Its beta is twice the average beta for AnaDone (before divestment). What will the beta of AnaDone be after divesting this division?

13. You run a regression of monthly returns of Mapco, an oil- and gas-producing firm, on the S&P 500 Index and come up with the following output for the period 1991 to 1995.

Intercept of the regression = 0.06%

X-coefficient of the regression = 0.46

Standard error of X-coefficient = 0.20

$R^2 = 5\%$

There are 20 million shares outstanding, and the current market price is $2/share. The firm has $20 million in debt outstanding. (The firm has a tax rate of 36 percent.)

    a.   What would an investor in Mapco's stock require as a return, if the Treasure bond rate is 6 percent?

    b.   What proportion of this firm's risk is diversifiable?

    c.   Assume now that Mapco has three divisions, of equal size (in market value terms). It plans to divest itself of one of the divisions for $20 million in cash and acquire another for $50 million (it will borrow $30 million to complete this acquisition). The division it is divesting is in a business line where the average unlevered beta is 0.20, and the division it is acquiring is in a business line where the average unlevered beta is 0.80. What will the beta of Mapco be after this acquisition?

14. You have just run a regression of monthly returns of American Airlines (AMR) against the S&P 500 over the past five years. You have misplaced some of the output and are trying to derive it from what you have.

    a.   You know the R^2 of the regression is 0.36, and that your stock has a variance of 67 percent. The market variance is 12 percent . What is the beta of AMR?

    b.   You also remember that AMR was not a very good investment during the period of the regression and that it did worse than expected (after adjusting for risk) by 0.39 percent a month for the five years of the regression. During this period, the average risk-free rate was 4.84 percent. What was the intercept on the regression?

    c. You are comparing AMR to another firm that also has an R^2 of 0.48. Will the two firms have the same beta? If not, why not?

15. You have run a regression of *monthly* returns on Amgen, a large biotechnology firm, against *monthly* returns on the S&P 500 Index, and come up with the following output:

$$R_{stock} = 3.28\% + 1.65\ R_{Market} \qquad\qquad R^2 = 0.20$$

The current one-year Treasury bill rate is 4.8 percent and the current thirty-year bond rate is 6.4 percent. The firm has 265 million shares outstanding, selling for $30 per share.

    a.   What is the expected return on this stock over the next year?

    b.   Would your expected return estimate change if the purpose was to get a discount rate to analyze a thirty-year capital budgeting project?

c.   An analyst has estimated correctly that the stock did 51.10 percent better than expected annually during the period of the regression. Can you estimate the annualized risk-free rate that she used for her estimate?

d. The firm has a debt/equity ratio of 3 percent and faces a tax rate of 40 percent. It is planning to issue $2 billion in new debt and acquire a new business for that amount, with the same risk level as the firm's existing business. What will the beta be after the acquisition?

16. You have just run a regression of monthly returns on MAD, a newspaper and magazine publisher, against returns on the S&P 500, and arrived at the following result:

$$R_{MAD} = -0.05\% + 1.20 \, R_{S\&P}$$

The regression has an R^2 of 22 percent. The current Treasure bill rate is 5.5 percent and the current Treasure bond rate is 6.5 percent. The risk-free rate during the period of the regression was 6 percent. Answer the following questions relating to the regression:

a. Based on the intercept, you can conclude that the stock did

   i.   0.05 percent worse than expected on a monthly basis, during the regression.

   ii. 0.05 percent better than expected on a monthly basis during the period of the regression.

   iii. 1.25 percent better than expected on a monthly basis during the period of the regression.

   iv. 1.25 percent worse than expected on a monthly basis during the period of the regression.

   v.   None of the above.

b. You now realize that MAD went through a major restructuring at the end of last month (which was the last month of your regression), and made the following changes:

   •   The firm sold off its magazine division, which had an unlevered beta of 0.6, for $20 million.

   •   It borrowed an additional $20 million, and bought back stock worth $40 million.

After the sale of the division and the share repurchase, MAD had $40 million in debt and $120 million in equity outstanding. If the firm's tax rate is 40 percent, reestimate the beta after these changes.

17. Time Warner, the entertainment conglomerate, has a beta of 1.61. Part of the reason for the high beta is the debt left over from the leveraged buyout of Time by Warner in 1989, which amounted to $10 billion in 1995. The market value of equity at Time Warner in 1995 was also $10 billion. The marginal tax rate was 40 percent.

    a. Estimate the unlevered beta for Time Warner.

    b. Estimate the effect of reducing the debt ratio by 10 percent each year for the next two years on the beta of the stock.

18. Chrysler, the automotive manufacturer, had a beta of 1.05 in 1995. It had $13 billion in debt outstanding in that year and 355 million shares trading at $50 per share. The firm had a cash balance of $8 billion at the end of 1995. The marginal tax rate was 36 percent.

    a. Estimate the unlevered beta of the firm.

    b. Estimate the effect of paying out a special dividend of $5 billion on this unlevered beta.

    c. Estimate the beta for Chrysler after the special dividend.

19. You are trying to estimate the beta of a private firm that manufactures home appliances. You have managed to obtain betas for publicly traded firms that also manufacture home appliances.

Firm	Beta	Debt (in million	MV of Equi millions)
Black & Decker	1.40	$2,500	$ 3,000
Fedders Corp.	1.20	$ 5	$ 200
Maytag Corp.	1.20	$ 540	$ 2250
National Presto	0.70	$ 8	$ 300
Whirlpool	1.50	$ 2900	$ 4000

The private firm has a debt equity ratio of 25 percent and faces a tax rate of 40 percent. The publicly traded firms all have marginal tax rates of 40 percent, as well.

    a. Estimate the beta for the private firm.

    b. What concerns, if any, would you have about using betas of comparable firms?

20. As the result of stockholder pressure, RJR Nabisco is considering spinning off its food division. You have been asked to estimate the beta for the division and decide to do so by obtaining the beta of comparable publicly traded firms. The average beta of comparable publicly

traded firms is 0.95, and the average debt/equity ratio of these firms is 35 percent. The division is expected to have a debt ratio of 25 percent. The marginal corporate tax rate is 36 percent.

a. What is the beta for the division?

b. Would it make any difference if you knew that RJR Nabisco had a much higher fixed cost structure than the comparable firms used here?

21. Southwestern Bell, a phone company, is considering expanding its operations into the media business. The beta for the company at the end of 1995 was 0.90, and the debt/equity ratio was 1. The media business is expected to be 30 percent of the overall firm value in 1999, and the average beta of comparable firms is 1.20; the average debt/equity ratio for these firms is 50 percent. The marginal corporate tax rate is 36 percent. <AQ: Should the dates in this question be updated?>

a. Estimate the beta for Southwestern Bell in 1999, assuming that it maintains its current debt/equity ratio.

b. Estimate the beta for Southwestern Bell in 1999, assuming that it decides to finance its media operations with a debt/equity ratio of 50 percent.

22. The chief financial officer of Adobe Systems, a software manufacturing firm, has approached you for some advice regarding the beta of his company. He subscribes to a service that estimates Adobe System's beta each year, and he has noticed that the beta estimates have gone down every year since 1991—2.35 in 1991 to 1.40 in 1995. He would like the answers to the following questions

a. Is this decline in beta unusual for a growing firm?

b. Why would the beta decline over time?

c. Is the beta likely to keep decreasing over time?

23. You are analyzing Tiffany's, an upscale retailer, and find that the regression estimate of the firm's beta is 0.75; the standard error for the beta estimate is 0.50. You also note that the average unlevered beta of comparable specialty retailing firms is 1.15.

a. If Tiffany's has a debt/equity ratio of 20 percent, estimate the beta for the company based on comparable firms. (The tax rate is 40 percent)

b. Estimate a range for the beta from the regression.

c. How would you reconcile the two estimates? Which one would you use in your analysis?