CHAPTER 6:
RISK AND RETURN IN PRACTICE: ESTIMATION OF DISCOUNT RATES

6-1
a. Expected Return to Short-term Investor = 5.8% + 0.95 (8.5%) = 13.88%
(I am using the historical premium of 8.5% to estimate expected returns)

b. Expected Return to Long-term Investor = 6.4% + 0.95 (5.5%) = 1 1.63%

c. I would use the expected return of 11.63% as the cost of equity.

6-2
a. Unlevered Beta = 0.95 / (1 + (1- 0.36) (1,700/1,500)) = 0.55

b. The beta of 0.95 can be broken down into business risk (0.55) and financial risk (0.40).

6-3
a. Cost of Equity = 6.40% + 1.70 (5.5%) = 15.75%

b. If the long-term bond rate rises to 7.5%, the cost of equity will rise by 1.1%.

c. Since the firm had no debt, all of the risk can be attributed to business risk.

6-4
a. Expected Return = 11.5% + 1.15 (7.50%) = 20.13%
{I am using a premium of 7.50% for Malaysian stocks to reflect its higher risk.}

b. This beta measures risk relative to a Malaysian index. For an international investor an more appropriate beta may be the one estimated relative to a global index.

6-5
a. Expected Return = 3% + 1.2 (8.5%) = 13.20%

b. Expected Price Appreciation = 13.20% - ($2.50 / $50) = 8.20%
Expected Price one year from today = $50 (1.082) = $54.10

c. Expected Returns over last year = 5% + 1.20 (-5% - 5%) =-7.00%
Returns on Market = -8% + 3% = -5%

d. Actual Returns over last year = (50-54+2)/54 = -3.70%

e. Unlevered Beta = 1.20 / (1+ (1-.4) (50/100)) = 0.923
If the firm issues $ 50 million in equity and retires debt, its beta will drop to 0.923.

6-6
Unlevered Beta = 1.20 / (1 + (1-0.4) (50/100)) = 0.923
New Beta = 0.923 (1 + (1-0.4) (8)) = 5.35

6-7
a. Unlevered Beta for Novell = 1.50! Firm has no debt
Unlevered Beta for WordPerfect = 1.30! Firm has no debt
Unlevered Beta for Combined Firm = 1.50 (2/(2+1)) + 1.30 (1/(2+1)) = 1.43
This would be the beta of the combined firm if the deal is all-equity.

b. If the deal is financed with debt,
New Debt/Equity Ratio = 1/2 = 0.5
New Beta = 1.43 (1 + (1-.4) (0.5)) = 1.86

6-8
a. The unlevered beta for Hewlett Packard as a company can be computed as the weithed averages of the unlevered betas, with the weights based upon the market values of each division.

$$\left(\frac{2}{8}\right)1.1+\left(\frac{2}{8}\right)1.5+\left(\frac{1}{8}\right)2.0+\left(\frac{3}{8}\right)1.0=1.275.$$

(We assume that the divisional betas are unlevered betas.) Since the divisional structure of Hewlett Packard has changed over the years, the beta obtained by regressing past returns of HP against a market index will not be the same as 1.275.
b. If the T. bond rate is 7.5%, the cost of (unlevered) equity for the divisions can be computed as follows:

Business Group	Cost of Equity
Mainframes	0.075+1.1(0.055) = 13.55%
Personal Groups	0.075+1.5(0.055) = 15.75%
Software	0.075+2.0(0.055) = 18.5%
Printers	0.075+1.0(0.055) = 13.00%

To value the printer division (assuming no leverage), we would use a cost of equity of 13%.
c. Assuming that the leverage is distributed across the divisions based upon their proportional values, we get the following values for each division, with the unlevered beta following:

Division	Beta	Unlevered Beta	Value of Equity	Value of Debt	Total Value
Mainframes	1.10	1.019	2.000	0.25	2.25

PCs	1.50	1.389	2.000	0.25	2.25
Software	2.00	1.852	1.000	0.125	1.125
Printers	1.00	0.926	3.000	0.375	3.375

After the divestiture, we'd have the unlevered beta equal to

$$\left(\frac{2.25}{6.75}\right)1.389 + \left(\frac{1.125}{6.75}\right)1.852 + \left(\frac{3.375}{6.75}\right)0.925 = 1.235.$$

Using the information that HP had debt outstanding equal to $1.0 billion, the levered beta equals

$$(1+(1-0.36)(1/5.75))= 1.36.$$

The equity drops in value, because the $2.25 million gets paid out as a dividend.

6-9

a.

Firm	***% Revenue***	***% OI***	***Operating Leverage***	***Beta***
Pharma Corp	27%	25%	0.93	1.00
SynerCorp	25%	32%	1.28	1.15
BioMed	23%	36%	1.57	1.30
Safemed	21%	40%	1.90	1.40

b. There is a clear relationship between the degree of operating leverage and the beta. The greater the degree of operating leverage, the more responsive income (and presumably stock returns) will be to changes in revenue which are correlated with changes in market movements.

6-10

Beta estimation services adjust betas towards one. It is possible that this adjustment is the reason for the difference between the regression beta (1.60) and the reported beta of 1.45.

6-11

The beta reflects market risk and is estimated relative to a stock index. To the extent that commodity prices and stock prices are not highly positively correlated the low betas reflect the low market risk inherent in these stocks. I would expect these firms to have substantial firm-specific risk.

6-12

Year	**AD**	**NYSE**
1981	10%	5%
1982	5%	15%
1983	-5%	-8%
1984	20%	12%
1985	5%	-5%

a. Regression Results

	Coefficients	Standard Error
Intercept	-0.14706	6.59342
X Variable	0.735294	0.670845

$R^2 = 0.285948$
The beta value of 0.735. The alpha is computed as –0.147.
b. Using the annualized 6-month T. bill rate as the riskfree rate, we get an expected return of 0.06 + 0.735(0.0876) = 12.44%.
c. Comparing the alpha of -0.147 to $(1-\beta)R_f = (1-0.735)0.06 = .0159$, we see that AD did worse than expected relative to the market.
d. The measure of risk that's relevant for an undiversified investor is the total risk. This can be measured as the standard deviation in AD returns.
e. $0.735 = (0.2)(2x0.735) + (0.8)\beta_{rem}$, where β_{rem} is the beta of the remaining firm.
Solving, we find $\beta_{rem} = 0.55$.
This is the beta after the divestiture, assuming that the cash is paid out and that the leverage is unaffected.

6-13
a. Expected Return = 6% + 0.46 (5.5%) = 8.53%

b. Proportion of the firm's risk that is diversifiable = 1 - R squared = 95%

c. Existing Debt/Equity Ratio = 20/(20*2) = 50.00%
Unlevered Beta for the firm = 0.46/(1+(1-.36) (.5)) = 0.35
Unlevered Beta of Firm without divested division
0.20 (20/60) + X (40/60) = 0.35
Solving for X,
X = (0.35 - 0.0667)/(40/60) = 0.42
New Unlevered Beta with new division,
0.42 (40/90) + 0.80 (50/90) = 0.63
New Debt/Equity Ratio = (20 + 30)/40 = 1.25
New Levered Beta = 0.63 (1 + (1-.36) (1.25)) = 1.13

6-14
a. R squared = $(\beta^2\sigma_m^2 / \sigma_m^2)$
$Beta^2 = (0.36*0.67)/0.12 = 2.01$
Beta = 1.42

b. Jensen's alpha = Intercept - Risk-free Rate (1-Beta)
-0.39% = Intercept - 0.39% (1-1.42)
Monthly Risk-free Rate = $(1.0484)^{1/12} - 1 = 0.39\%$
Solving for the intercept,
Intercept = -0.39% + 0.39% (1-1.42) = -0.55%

c. The two firms might not have the same beta, because they might have different total variances.

6-15

a. Expected Return on the Stock over next year = 4.8% + 1.65 (8.5%) = 18.83%

b. . In this case, we would use a geometric average estimate of the risk premium and a long-term T. bond rate to get 0.064 + (1.65)(0.055) = 15.48%

c.

Monthly Jensen's Alpha = $(1.51)^{1/12}$ - 1 = 3.49%
3.49% = 3.28% - Risk-free Rate (1-1.65)
Solving for the riskless rate,
Monthly Riskless Rate = 0.21%/(0.65) = 0.32%
Annualized Riskless Rate = $(1.0032)^{12}$ - 1 = 3.91%

d. Unlevered Beta = 1.65 / (1 + (1-.4)(.03)) =1.62
Market Value of Equity = 265 * $ 30 = $7,950.00
Existing Debt = 0.03 (7950) = $238.50
New Debt = $ 238.50 + $ 2000 = $2,238.50
New Levered Beta = 1.62 (1 + (1-.4) (2238.5/7950) = 1.89

6-16

a. Intercept - Risk-free Rate (1-Beta) = -0.05% - 0.49% (1-1.20) = 0.05%
Monthly Risk-free Rate = $1.06^{(1/12)}$ - 1 = 0.49%
The stock did 0.05% better than expected during the period of the regression.

b. Debt before restructuring = $ 40 million - $ 20 million = $20 million
Equity before restructuring = $ 120 million + $ 40 million = $160 million
Debt/Equity Ratio before restructuring = 20/160 = 12.50%
Unlevered Beta before restructuring = 1.20 / (1+(1-.4)(.125)) = 1.12
Unlevered Beta after the divisional sale,
0.6(20/180) + X (160/180) = 1.12
Solving for X,
Unlevered Beta after divisional sale = 1.19
New Debt/Equity Ratio after restructuring = 40/120 = 0.33
New Beta = 1.19 (1 + (1-.4) (0.33)) = 1.43

6-17

a. Unlevered Beta = 1.61 / (1+(1-.4) (10/10)) = 1.01

b. Based on the current debt ratio of 50%, we can find the new D/E ratios and levered betas as follows:

Year	Debt Ratio	D/E	Beta
1	40%	0.6667	1.41

2 30% 0.4286 1.27

6-18

a. Unlevered Beta = 1.05 / (1 + (1-.36)(13,000/(355*50)) = 0.715

b. If the beta is estimated for Chrysler with the cash, paying a special dividend of $ 5 billion will change the unlevered beta. In the analysis above, if 0.715 is the unlevered beta with cash of $ 13 billion in the firm, the unlevered beta after the special dividend can be estimated as follows:
Value of Non-cash assets = 13000 + 355*50 – 8000 = 22,750
Beta of non-cash assets (22,750/30,750) + 0 (8000/30,750) = 0.715
[Beta for cash=0]
Beta of Non-cash assets = 0.715/(22750/30750) = 0.966
New Unlevered Beta = 0.966 (22,750/25,750) + 0 (3000/25750) = 0.853
c. The new debt ratio would be rise since dividends reduce the value of the equity:
13000/(355x50-5000) = 101.96%
. The levered beta is
0.853(1+(1-0.36)(1.0196))) = 1.41

6-19

Firm	Beta	debt	equity	d/e	unlevered beta
Black and Decker	1.4	2500	3000	0.833333	0.933333
Fedders	1.2	5	200	0.025	1.182266
Maytag	1.2	540	2250	0.24	1.048951
National Presto	0.7	8	300	0.026667	0.688976
Whirlpool	1.5	2900	4000	0.725	1.045296
Average	1.2			0.37	1.045296

The average unlevered beta can be computed in one of two ways. The average beta for the comparable firms and the average debt/equity ratio can be used to compute it:
Unlevered Beta = 1.20 / (1 + (1-0.4) (0.37)) = 0.982
Alternatively, the unlevered beta for each firm can be estimated, and the average unlevered beta = 0.9798.
The first approach is less time consuming, and provides estimates that are very close to the second one.
Using the private firm's leverage ratio of 25%, we can compute a levered beta of 0.982(1+(1-0.4)(0.25))= 1.129.
b. It might be that there are differences amongst these firms and between these firms and the private firm that are not averaged out in the numbers. For example, the degree of operating leverage might be different, as might the business mix in each firm.

6-20

a. Unlevered Beta for Food Business = 0.95/ (1 + (1-.36) (.35)) = 0.78
Beta for Food Division = 0.78 (1 + (1-.36) (.25)) = 0.90

b. Yes. The higher fixed cost structure would lead me to use a higher unlevered beta for Nabisco.

6-21

a. Unlevered Beta of phone business = 0.90 / (1+0.64*1) = 0.55
Unlevered Beta of media business = 1.20 / (1 + 0.64*.5) = 0.91
Unlevered Beta in 1999 = 0.7 (0.55) + 0.3 (0.91) = 0.66
Beta in 1999 = 0.66 (1 + (1-.36) (1.00)) = 1.08

b. If it finances its media operations with a 50% D/E ratio,
Overall Debt Ratio = 0.5 (.7) + .33 (.3) = 0.45
Overall Debt/Equity Ratio = 45/55 = 9/11
Beta with this debt ratio = 0.66 (1 + 0.64 (9/11)) = 1.00

6-22

a. No, it is not unusual. As firms grow and become larger, they generally become more diversified and less risky.

b. I would expect it to continue since Adobe still has a beta well above one.
c. I would expect the rate of decline to drop as the beta approaches one.

6-23

a. Unlevered Beta of comparable firms = 1.15
Beta for Tiffany's based on comparable firms = 1.15 (1 + 0.6*.2) = 1.29

b. Range for beta from regression
With one standard error : 0.25 ~ 1.25

c. The regression estimate is very noisy. It is entirely possible that both of these estimates are from the same distribution; I would trust the "comparable firm" estimate more, since the average across comparable firms will have less noise than any individual firm's beta estimate.