公司金融/Fall 2021/ HW#2 Key

Chapter 10

Question 1

Calculating Returns Suppose a stock had an initial price of $75 per share, paid a dividend of $1.20 per share during the year, and had an ending share price of $86. Compute the percentage total return.

The return of any asset is the increase in price, plus any dividends or cash flows, all divided by the initial price. The return of this stock is:

R = [($86 – 75) + 1.20] / $75
R = .1627, or 16.27%

Question 2

Calculating Returns and Variability You've observed the following returns on Mary Ann Data Corporation's stock over the past five years: 27 percent, 13 percent, 18 percent, −14 percent, and 9 percent.

a. What was the arithmetic average return on Mary Ann's stock over this five-year period?
b. What was the variance of Mary Ann's returns over this period? The standard deviation?

a. To find the average return, we sum all the returns and divide by the number of returns, so:

Arithmetic average return = (.27 +.13 + .18 – .14 + .09)/5
Arithmetic average return = .1060, or 10.60%

b. Using the equation to calculate variance, we find:

$$\text{Variance} = 1/4[(.27 - .106)^2 + (.13 - .106)^2 + (.18 - .106)^2 + (-.14 - .106)^2 + (.09 - .106)^2]$$
Variance = 0.023430

So, the standard deviation is:

Standard deviation = $(0.023430)^{1/2}$
Standard deviation = 0.1531, or 15.31%

Question 3

Arithmetic and Geometric Returns A stock has had the following year-end prices and dividends:

Year	Price	Dividend
1	$61.18	—
2	64.83	$ .72
3	72.18	.78
4	63.12	.86
5	69.27	.95
6	76.93	1.08

What are the arithmetic and geometric returns for the stock?

To calculate the arithmetic and geometric average returns, we must first calculate the return for each year. The return for each year is:

R_1 = ($64.83 – 61.18 + 0.72) / $61.18 = .0714, or 7.14%
R_2 = ($72.18 – 64.83 + 0.78) / $64.83 = .1254, or 12.54%
R_3 = ($63.12 – 72.18 + 0.86) / $72.18 = –.1136, or –11.36%
R_4 = ($69.27 – 63.12 + 0.95)/ $63.12 = .1125, or 11.25%
R_5 = ($76.93 – 69.27 + 1.08) / $69.27 = .1262, or 12.62%

The arithmetic average return was:

$R_A = (0.0714 + 0.1254 – 0.1136 + 0.1125 + 0.1262)/5$
$R_A = 0.0644$, or 6.44%

And the geometric average return was:

$R_G = [(1 + .0714)(1 + .1254)(1 – .1136)(1 + .1125)(1 + .1262)]^{1/5} – 1$
$R_G = 0.0601$, or 6.01%

Question 4

Holding Period Return A stock has had returns of 16.12 percent, 12.11 percent, 5.83 percent, 26.14 percent, and −13.19 percent over the past five years, respectively. What was the holding period return for the stock?

Apply the five-year holding-period return formula to calculate the total return of the stock over the five-year period, we find:

5-year holding-period return = $[(1 + R_1)(1 + R_2)(1 + R_3)(1 + R_4)(1 + R_5)] - 1$
5-year holding-period return = $[(1 + .1612)(1 + .1211)(1 + .0583)(1 + .2614)(1 - .1319)] - 1$
5-year holding-period return = 0.5086, or 50.86%

Chapter 11

Question 1

Portfolio Expected Return You have $10,000 to invest in a stock portfolio. Your choices are Stock X with an expected return of 14 percent and Stock Y with an expected return of 9 percent. If your goal is to create a portfolio with an expected return of 12.9 percent, how much money will you invest in Stock X? In Stock Y?

Here we are given the expected return of the portfolio and the expected return of each asset in the portfolio and are asked to find the weight of each asset. We can use the equation for the expected return of a portfolio to solve this problem. Since the total weight of a portfolio must equal 1 (100%), the weight of Stock Y must be one minus the weight of Stock X. Mathematically speaking, this means:

$E(R_p) = .129 = .14X_X + .09(1 - X_X)$

We can now solve this equation for the weight of Stock X as:

$.129 = .14X_X + .09 - .10X_X$
$.039 = .04X_X$
$X_X = 0.7800$

So, the dollar amount invested in Stock X is the weight of Stock X times the total portfolio value, or:

Investment in X = 0.7800($10,000) = $7,800

And the dollar amount invested in Stock Y is:

Investment in Y = (1 – 0.7800)($10,000) = $2,200

Question 2

Calculating Returns and Standard Deviations Based on the following information, calculate the expected return and standard deviation for the two stocks:

State of Economy	Probability of State of Economy	Rate of Return if State Occurs	
		Stock *A*	Stock *B*
Recession	.20	.06	−.20
Normal	.55	.07	.13
Boom	.25	.11	.33

The expected return of an asset is the sum of the probability of each return occurring times the probability of that return occurring. So, the expected return of each stock asset is:

$E(R_A) = .20(.06) + .55(.07) + .25(.11) = .0780$, or 7.80%

$E(R_B) = .20(-.20) + .55(.13) + .25(.33) = .1140$, or 11.40%

To calculate the standard deviation, we first need to calculate the variance. To find the variance, we find the squared deviations from the expected return. We then multiply each possible squared deviation by its probability, and then add all of these up. The result is the variance. So, the variance and standard deviation of each stock are:

$\sigma_A^2 = .20(.06 - .0780)^2 + .55(.07 - .0780)^2 + .25(.11 - .0780)^2 = .00036$

$\sigma_A = (.00036)^{1/2} = .0189$, or 1.89%

$\sigma_B^2 = .20(-.20 - .1140)^2 + .55(.13 - .1140)^2 + .25(.33 - .1140)^2 = .03152$

$\sigma_B = (.03152)^{1/2} = .1775$, or 17.75%

Question 3

Calculating Portfolio Betas You own a stock portfolio invested 10 percent in Stock *Q*, 35 percent in Stock *R*, 20 percent in Stock *S*, and 35 percent in Stock *T*. The betas for these four stocks are .75, 1.90, 1.38, and 1.16, respectively. What is the portfolio beta?

The beta of a portfolio is the sum of the weight of each asset times the beta of each asset. So, the beta of the portfolio is:

$\beta_p = .10(.75) + .35(1.90) + .20(1.38) + .35(1.16) = 1.42$

Question 4

Using CAPM A stock has an expected return of 10.2 percent, the risk-free rate is 4 percent, and the market risk premium is 7 percent. What must the beta of this stock be?

We are given the values for the CAPM except for the β of the stock. We need to substitute these values into the CAPM, and solve for the β of the stock. One important thing we need to realize is that we are given the market risk premium. The market risk premium is the expected return of the market minus the risk-free rate. We must be careful not to use this value as the expected return of the market. Using the CAPM, we find:

$E(R_i) = .102 = .04 + .07\beta_i$

$\beta_i = 0.89$

Question 5

Covariance and Correlation Based on the following information, calculate the expected return and standard deviation of each of the following stocks. Assume each state of the economy is equally likely to happen. What are the covariance and correlation between the returns of the two stocks?

State of Economy	Return on Stock *A*	Return on Stock *B*
Bear	.102	−.045
Normal	.115	.148
Bull	.073	.233

The expected return of an asset is the sum of the probability of each return occurring times the probability of that return occurring. So, the expected return of each stock is:

$E(R_A) = .33(.102) + .33(.115) + .33(.073) = .0967$, or 9.67%

$E(R_B) = .33(–.045) + .33(.148) + .33(.233) = .1120$, or 11.20%

To calculate the standard deviation, we first need to calculate the variance. To find the variance, we find the squared deviations from the expected return. We then multiply each possible squared deviation by its probability, and then add all of these up. The result is the variance. So, the variance and standard deviation of Stock A are:

$\sigma^2 = .33(.102 – .0967)^2 + .33(.115 – .0967)^2 + .33(.073 – .0967)^2 = .00031$

$\sigma = (.00031)^{1/2} = .0176$, or 1.76%

And the standard deviation of Stock B is:

$\sigma^2 = .33(–.045 – .1120)^2 + .33(.148 – .1120)^2 + .33(.233 – .1120)^2 = .01353$

$\sigma = (.01353)^{1/2} = .1163$, or 11.63%

To find the covariance, we multiply each possible state times the product of each assets' deviation from the mean in that state. The sum of these products is the covariance. So, the covariance is:

$Cov(A,B) = .33(.102 – .0967)(–.045 – .1120) + .33(.115 – .0967)(.148 – .1120)$
$+ .33(.073 – .0967)(.233 – .1120)$

Cov(A,B) = –.001014

And the correlation is:

$\rho_{A,B}$ = Cov(A,B) / σ_A σ_B
$\rho_{A,B}$ = –.001014 / (.0176)(.1163)
$\rho_{A,B}$ = –.4964

Chapter 13

Question 1

Calculating WACC Mullineaux Corporation has a target capital structure of 70 percent common stock and 30 percent debt. Its cost of equity is 13 percent, and the cost of debt is 6 percent. The relevant tax rate is 35 percent. What is Mullineaux's WACC?

Using the equation to calculate the WACC, we find:

$R_{WACC} = .70(.13) + .30(.06)(1 - .35) = .1027$, or 10.27%

Question 2

Finding the Capital Structure Fama's Llamas has a weighted average cost of capital of 9.8 percent. The company's cost of equity is 13 percent, and its cost of debt is 6.5 percent. The tax rate is 35 percent. What is Fama's debt–equity ratio?

Here we have the WACC and need to find the debt-equity ratio of the company. Setting up the WACC equation, we find:

$R_{WACC} = .0980 = .13(S/V) + .065(B/V)(1 - .35)$

Rearranging the equation, we find:

$.0980(V/S) = .13 + .065(.65)(B/S)$

Now we must realize that the V/S is just the equity multiplier, which is equal to:

$V/S = 1 + B/S$

$.0980(B/S + 1) = .13 + .04225(B/S)$

Now we can solve for B/S as:

$.05575(B/S) = .032$
$B/S = .5740$

Question 3

SML and WACC An all-equity firm is considering the following projects:

Project	Beta	IRR
W	.80	9.4%
X	.95	10.9
Y	1.15	13.0
Z	1.45	14.2

The T-bill rate is 3.5 percent, and the expected return on the market is 11 percent.

a. Which projects have a higher expected return than the firm's 11 percent cost of capital?
b. Which projects should be accepted?
c. Which projects would be incorrectly accepted or rejected if the firm's overall cost of capital was used as a hurdle rate?

a. Projects Y and Z.

b. Using the CAPM to consider the projects, we need to calculate the expected return of each project given its level of risk. This expected return should then be compared to the expected return of the project. If the return calculated using the CAPM is lower than the project expected return, we should accept the project; if not, we reject the project. After considering risk via the CAPM:

E[W] = .035 + .80(.11 – .035) = .0950 > .094, so reject W
E[X] = .035 + .95(.11 – .035) = .1063 < .109, so accept X
E[Y] = .035 + 1.15(.11 – .035) = .1213 < .13, so accept Y
E[Z] = .035 + 1.45 (.11 – .035) = .1438 > .142, so reject Z

c. Project X would be incorrectly rejected; Project Z would be incorrectly accepted.

Question 4

Flotation Costs and NPV Photochronograph Corporation (PC) manufactures time series photographic equipment. It is currently at its target debt–equity ratio of .55. It's considering building a new $50 million manufacturing facility. This new plant is expected to generate aftertax cash flows of $6.7 million a year in perpetuity. The company raises all equity from outside financing. There are three financing options:

1. *A new issue of common stock:* The flotation costs of the new common stock would be 8 percent of the amount raised. The required return on the company's new equity is 14 percent.
2. *A new issue of 20-year bonds:* The flotation costs of the new bonds would be 4 percent of the proceeds. If the company issues these new bonds at an annual coupon rate of 8 percent, they will sell at par.
3. *Increased use of accounts payable financing:* Because this financing is part of the company's ongoing daily business, it has no flotation costs, and the company assigns it a cost that is the same as the overall firm WACC. Management has a target ratio of accounts payable to long-term debt of .20. (Assume there is no difference between the pretax and aftertax accounts payable cost.)

What is the NPV of the new plant? Assume that PC has a 35 percent tax rate.

We can use the debt-equity ratio to calculate the weights of equity and debt. The debt of the company has a weight for long-term debt and a weight for accounts payable. We can use the weight given for accounts payable to calculate the weight of accounts payable and the weight of long-term debt. The weight of each will be:

Accounts payable weight = .20/1.20 = .17
Long-term debt weight = 1/1.20 = .83

Since the accounts payable has the same cost as the overall WACC, we can write the equation for the WACC as:

R_{WACC} = (1/1.55)(.14) + (0.55/1.55)[(.20/1.2) R_{WACC} + (1/1.2)(.08)(1 – .35)]

Solving for WACC, we find:
R_{WACC} = .0903 + .3548[(.20/1.2)R_{WACC} + .0433]
R_{WACC} = .0903 + (.0591)R_{WACC} + .0154
(.9409)R_{WACC} = .1057
R_{WACC} = .1123, or 11.23%

We will use basically the same equation to calculate the weighted average flotation cost, except we will use the flotation cost for each form of financing. Doing so, we get:

Flotation costs = (1/1.55)(.08) + (0.55/1.55)[(.20/1.2)(0) + (1/1.2)(.04)] = .0634, or 6.34%

The total amount we need to raise to fund the new equipment will be:

Amount raised cost = $50,000,000/(1 – .0634)
Amount raised = $53,386,912

Since the cash flows go to perpetuity, we can calculate the present value using the equation for the PV of a perpetuity. The NPV is:

NPV = –$53,386,912 + ($6,700,000/.1123)
NPV = $6,251,949

Question 5

Flotation Costs Trower Corp. has a debt–equity ratio of .85. The company is considering a new plant that will cost $145 million to build. When the company issues new equity, it incurs a flotation cost of 8 percent. The flotation cost on new debt is 3.5 percent. What is the initial cost of the plant if the company raises all equity externally? What if it typically uses 60 percent retained earnings? What if all equity investments are financed through retained earnings?

We can use the debt-equity ratio to calculate the weights of equity and debt. The weight of debt in the capital structure is:

X_B = .85 / 1.85 = .4595, or 45.95%

And the weight of equity is:

X_S = 1 – .4595 = .5405, or 54.05%

Now we can calculate the weighted average flotation costs for the various percentages of internally raised equity. To find the portion of equity flotation costs, we can multiply the equity costs by the percentage of equity raised externally, which is one minus the percentage raised internally. So, if the company raises all equity externally, the flotation costs are:

f_T = (0.5405)(.08)(1 – 0) + (0.4595)(.035)
f_T = .0593, or 5.93%

The initial cash outflow for the project needs to be adjusted for the flotation costs. To account for the flotation costs:

Amount raised(1 – .0593) = $145,000,000
Amount raised = $145,000,000/(1 – .0593)
Amount raised = $154,144,519

If the company uses 60 percent internally generated equity, the flotation cost is:

$f_T = (0.5405)(.08)(1 – 0.60) + (0.4595)(.035)$
$f_T = .0334$, or 3.34%

And the initial cash flow will be:

Amount raised(1 – .0334) = $145,000,000
Amount raised = $145,000,000/(1 – .0334)
Amount raised = $150,006,990

If the company uses 100 percent internally generated equity, the flotation cost is:

$f_T = (0.5405)(.08)(1 – 1) + (0.4595)(.035)$
$f_T = .0161$, or 1.61%

And the initial cash flow will be:

Amount raised(1 – .0161) = $145,000,000
Amount raised = $145,000,000/(1 – .0161)
Amount raised = $147,369,867

Chapter 15

Question 1

Cumulative Voting An election is being held to fill three seats on the board of directors of a firm in which you hold stock. The company has 7,600 shares outstanding. If the election is conducted under cumulative voting and you own 300 shares, how many more shares must you buy to be assured of earning a seat on the board?

If the company uses cumulative voting, the board of directors are all elected at once. You will need 1/(*N* + 1) percent of the stock (plus one share) to guarantee election, where *N* is the number of seats up for election. So, the percentage of the company's stock you need is:

Percent of stock needed = 1/(*N* + 1)
Percent of stock needed = 1 / (3 + 1)
Percent of stock needed = .25 or 25%

So, the number of shares you need is:

Number of shares to purchase = (7,600 × .25) + 1
Number of shares to purchase = 1,901

So, the number of additional shares you need to purchase is:

New shares to purchase = 1,901 – 300
New shares to purchase = 1,601

Question 2

Corporate Voting Candle box Inc. is going to elect six board members next month. Betty Brown owns 17.4 percent of the total shares outstanding. How confident can she be of having one of her candidate friends elected under the cumulative voting rule? Will her friend be elected for certain if the voting procedure is changed to the staggering rule, under which shareholders vote on two board members at a time?

Under cumulative voting, she will need 1/(*N* + 1) percent of the stock (plus one share) to guarantee election, where *N* is the number of seats up for election. So, the percentage of the company's stock she needs is:

Percent of stock needed = 1/(*N* + 1)
Percent of stock needed = 1 / (6 + 1)
Percent of stock needed = .1429 or 14.29%

Her nominee is guaranteed election. If the elections are staggered, the percentage of the company's stock needed is:

Percent of stock needed = 1/(*N* + 1)
Percent of stock needed = 1 / (2 + 1)
Percent of stock needed = .3333, or 33.33%

Her nominee is no longer guaranteed election.

Chapter 16

Question 1

EBIT and Leverage Money, Inc., has no debt outstanding and a total market value of $275,000. Earnings before interest and taxes, EBIT, are projected to be $21,000 if economic conditions are normal. If there is strong expansion in the economy, then EBIT will be 25 percent higher. If there is a recession, then EBIT will be 40 percent lower. Money is considering a $99,000 debt issue with an interest rate of 8 percent. The proceeds will be used to repurchase shares of stock. There are currently 5,000 shares outstanding. Ignore taxes for this problem.

a. Calculate earnings per share, EPS, under each of the three economic scenarios before any debt is issued. Also calculate the percentage changes in EPS when the economy expands or enters a recession.

b. Repeat part (a) assuming that Money goes through with recapitalization. What do you observe?

a. A table outlining the income statement for the three possible states of the economy is shown below. The EPS is the net income divided by the 5,000 shares outstanding. The last row shows the percentage change in EPS the company will experience in a recession or an expansion economy.

	Recession	Normal	Expansion
EBIT	$12,600	$21,000	$26,250
Interest	0	0	0
NI	$12,600	$21,000	$26,250
EPS	$ 2.52	$ 4.20	$ 5.25
%ΔEPS	–40	——	+25

b. If the company undergoes the proposed recapitalization, it will repurchase:

Share price = Equity / Shares outstanding
Share price = $275,000/5,000
Share price = $55

Shares repurchased = Debt issued / Share price
Shares repurchased =$99,000/**$55**
Shares repurchased = 1,800
Shares outstanding after the recapitalization = 5000-1800 = 3200

The interest payment each year under all three scenarios will be:

Interest payment = $99,000(.08) = $7,920

The last row shows the percentage change in EPS the company will experience in a recession or an expansion economy under the proposed recapitalization.

	Recession	Normal	Expansion
EBIT	$12,600	$21,000	$26,250
Interest	7,920	7,920	7,920
NI	$ 4,680	$13,080	$18,330
EPS	$1.46	$ 4.09	$ 5.73
%ΔEPS	–64.22	——	+40.14

Question 2

Break-Even EBIT Rolston Corporation is comparing two different capital structures, an all-equity plan (Plan I) and a levered plan (Plan II). Under Plan I, Rolston would have 265,000 shares of stock outstanding. Under Plan II, there would be 185,000 shares of stock outstanding and $2.8 million in debt outstanding. The interest rate on the debt is 10 percent and there are no taxes.

a. If EBIT is $750,000, which plan will result in the higher EPS?
b. If EBIT is $1,500,000, which plan will result in the higher EPS?
c. What is the break-even EBIT?

a. Under Plan I, the unlevered company, net income is the same as EBIT with no corporate tax. The EPS under this capitalization will be:

EPS = $750,000/265,000 shares
EPS = $2.83

Under Plan II, the levered company, EBIT will be reduced by the interest payment. The interest payment is the amount of debt times the interest rate, so:

NI = $750,000 – .10($2,800,000)
NI = $470,000

And the EPS will be:

EPS = $470,000/185,000 shares
EPS = $2.54

Plan I has the higher EPS when EBIT is $750,000.

b. Under Plan I, the net income is $1,500,000 and the EPS is:

EPS = $1,500,000/265,000 shares
EPS = $5.66

Under Plan II, the net income is:

NI = $1,500,000 – .10($2,800,000)
NI = $1,220,000

And the EPS is:

EPS = $1,220,000/185,000 shares
EPS = $6.59

Plan II has the higher EPS when EBIT is $1,500,000.

c. To find the breakeven EBIT for two different capital structures, we simply set the equations for EPS equal to each other and solve for EBIT. The breakeven EBIT is:

EBIT/265,000 = [EBIT – .10($2,800,000)]/185,000
EBIT = $927,500

Question 3

MM and Taxes Bruce & Co. expects its EBIT to be $185,000 every year forever. The firm can borrow at 9 percent. Bruce currently has no debt, and its cost of equity is 16 percent. If the tax rate is 35 percent, what is the value of the firm? What will the value be if Bruce borrows $135,000 and uses the proceeds to repurchase shares?

a. The value of the unlevered firm is:

$V = \text{EBIT}(1 - t_C)/R_0$
$V = \$185{,}000(1 - .35)/.16$
$V = \$751{,}562.50$

b. The value of the levered firm is:

$V = V_U + t_C B$
$V = \$751{,}562.50 + .35(\$135{,}000)$
$V = \$798{,}812.50$

Question 4

MM with Taxes Williamson, Inc., has a debt–equity ratio of 2.5. The firm's weighted average cost of capital is 10 percent, and its pretax cost of debt is 6 percent. Williamson is subject to a corporate tax rate of 35 percent.

a. What is Williamson's cost of equity capital?
b. What is Williamson's unlevered cost of equity capital?
c. What would Williamson's weighted average cost of capital be if the firm's debt–equity ratio were .75? What if it were 1.5?

a. In a world with corporate taxes, a firm's weighted average cost of capital is equal to:

$R_{WACC} = [B / (B+S)](1 - t_C)R_B + [S / (B+S)]R_S$

We do not have the company's debt-to-value ratio or the equity-to-value ratio, but we can calculate either from the debt-to-equity ratio. With the given debt-equity ratio, we know the company has 2.5 dollars of debt for every dollar of equity. Since we only need the ratio of debt-to-value and equity-to-value, we can say:

$B / (B+S) = 2.5 / (2.5 + 1) = .7143$
$S / (B+S) = 1 / (2.5 + 1) = .2857$

We can now use the weighted average cost of capital equation to find the cost of equity, which is:

$.10 = (.7143)(1 – 0.35)(.06) + (.2857)(R_S)$
$R_S = .2525$, or 25.25%

b. We can use Modigliani-Miller Proposition II with corporate taxes to find the unlevered cost of equity. Doing so, we find:

$R_S = R_0 + (B/S)(R_0 – R_B)(1 – t_C)$
$.2525 = R_0 + (2.5)(R_0 – .06)(1 – .35)$
$R_0 = .1333$, or 13.33%

c. We first need to find the debt-to-value ratio and the equity-to-value ratio. We can then use the cost of levered equity equation with taxes, and finally the weighted average cost of capital equation. So:

If debt-equity = .75

$B / (B+S) = .75 / (.75 + 1) = .4286$
$S / (B+S) = 1 / (.75 + 1) = .5714$

The cost of levered equity will be:

$R_S = R_0 + (B/S)(R_0 – R_B)(1 – t_C)$
$R_S = .1333 + (.75)(.1333 – .06)(1 – .35)$
$R_S = .1691$, or 16.91%

And the weighted average cost of capital will be:

$R_{WACC} = [B / (B+S)](1 – t_C)R_B + [S / (B+S)]R_S$
$R_{WACC} = (.4286)(1 – .35)(.06) + (.5714)(.1691)$
$R_{WACC} = .1133$, or 11.33%

If debt-equity =1.50

$B / (B+S) = 1.50 / (1.50 + 1) = .6000$
$S / (B+S) = 1 / (1.50 + 1) = .4000$

The cost of levered equity will be:

$R_S = R_0 + (B/S)(R_0 - R_B)(1 - t_C)$
$R_S = .1333 + (1.50)(.1333 - .06)(1 - .35)$
$R_S = .2048$, or 20.48%

And the weighted average cost of capital will be:

$R_{WACC} = [B / (B+S)](1 - t_C)R_B + [S / (B+S)]R_S$
$R_{WACC} = (.6000)(1 - .35)(.06) + (.4000)(.2048)$
$R_{WACC} = .1053$, or 10.53%

Question 5

Cost of Capital Acetate, Inc., has equity with a market value of $23 million and debt with a market value of $7 million. Treasury bills that mature in one year yield 5 percent per year, and the expected return on the market portfolio is 12 percent. The beta of Acetate's equity is 1.15. The firm pays no taxes.

a. What is Acetate's debt–equity ratio?
b. What is the firm's weighted average cost of capital?
c. What is the cost of capital for an otherwise identical all-equity firm?

a. A firm's debt-equity ratio is the market value of the firm's debt divided by the market value of a firm's equity. So, the debt-equity ratio of the company is:

Debt-equity ratio = MV of debt / MV of equity
Debt-equity ratio = $7,000,000 / $23,000,000
Debt-equity ratio = .30

b. We first need to calculate the cost of equity. To do this, we can use the CAPM, which gives us:

$R_S = R_F + \beta[E(R_M) - R_F]$
$R_S = .05 + 1.15(.12 - .05)$
$R_S = .1305$, or 13.05%

We need to remember that an assumption of the Modigliani-Miller theorem is that the company debt is risk-free, so we can use the Treasury bill rate as the cost of debt

for the company. In the absence of taxes, a firm's weighted average cost of capital is equal to:

$R_{WACC} = [B / (B + S)]R_B + [S / (B + S)]R_S$
$R_{WACC} = (\$7,000,000/\$30,000,000)(.05) + (\$23,000,000/\$30,000,000)(.1305)$
$R_{WACC} = .1117$, or 11.17%

c. According to Modigliani-Miller Proposition II with no taxes:

$R_S = R_0 + (B/S)(R_0 - R_B)$
$.1305 = R_0 + (.30)(R_0 - .05)$
$R_0 = .1117$, or 11.17%

This is consistent with Modigliani-Miller's proposition that, in the absence of taxes, the cost of capital for an all-equity firm is equal to the weighted average cost of capital of an otherwise identical levered firm.

Chapter 17

Question 1

Nonmarketed Claims Dream, Inc., has debt outstanding with a face value of $6 million. The value of the firm if it were entirely financed by equity would be $17.85 million. The company also has 350,000 shares of stock outstanding that sell at a price of $38 per share. The corporate tax rate is 35 percent. What is the decrease in the value of the company due to expected bankruptcy costs?

According to M&M Proposition I with taxes, the value of the levered firm is:

$V_L = V_U + t_C B$
V_L = $17,850,000 + .35($6,000,000)
V_L = $19,950,000

We can also calculate the market value of the firm by adding the market value of the debt and equity. Using this procedure, the total market value of the firm is:

$V = B + S$
V = $6,000,000 + 350,000($38)
V = $19,300,000

With no nonmarketed claims, such as bankruptcy costs, we would expect the two values to be the same. The difference is the value of the nonmarketed claims, which are:

$V_T = V_M + V_N$
$19,300,000 = $19,950,000 – V_N
V_N = $650,000

Question 2

Costs of Financial Distress Steinberg Corporation and Dietrich Corporation are identical firms except that Dietrich is more levered. Both companies will remain in business for one more year. The companies' economists agree that the probability of the continuation of the current expansion is 80 percent for the next year, and the probability of a recession is 20 percent. If the expansion continues, each firm will generate earnings before interest and taxes (EBIT) of $2.7 million. If a recession occurs, each firm will generate earnings before interest and taxes (EBIT) of $1.1 million. Steinberg's debt obligation requires the firm to pay $900,000 at the end of the year. Dietrich's debt obligation requires the firm to pay $1.2 million at the end of the year. Neither firm pays taxes. Assume a discount rate of 13 percent.

a. What is the value today of Steinberg's debt and equity? What about that for Dietrich's?

b. Steinberg's CEO recently stated that Steinberg's value should be higher than Dietrich's because the firm has less debt and therefore less bankruptcy risk. Do you agree or disagree with this statement?

a. The total value of a firm's equity is the discounted expected cash flow to the firm's stockholders. If the expansion continues, each firm will generate earnings before interest and taxes of $2,700,000. If there is a recession, each firm will generate earnings before interest and taxes of only $1,100,000. Since Steinberg owes its bondholders $900,000 at the end of the year, its stockholders will receive $1,800,000 (= $2,700,000 – 900,000) if the expansion continues. If there is a recession, its stockholders will only receive $200,000 (= $1,100,000 – 900,000). So, assuming a discount rate of 13 percent, the market value of Steinberg's equity is:

$S_{\text{Steinberg}}$ = [.80($1,800,000) + .20($200,000)] / 1.13 = $1,309,735

Steinberg's bondholders will receive $900,000 whether there is a recession or a continuation of the expansion. So, the market value of Steinberg's debt is:

$B_{\text{Steinberg}}$ = [.80($900,000) + .20($900,000)] / 1.13 = $796,460

Since Dietrich owes its bondholders $1,200,000 at the end of the year, its stockholders will receive $1,500,000 (= $2,700,000 – 1,200,000) if the expansion continues. If there is a recession, its stockholders will receive nothing since the firm's bondholders have a more senior claim on all $1,100,000 of the firm's earnings. So, the market value of Dietrich's equity is:

S_{Dietrich} = [.80($1,500,000) + .20($0)] / 1.13 = $1,061,947

Dietrich's bondholders will receive $1,200,000 if the expansion continues and $1,100,000 if there is a recession. So, the market value of Dietrich's debt is:

B_{Dietrich} = [.80($1,200,000) + .20($1,100,000)] / 1.13 = $1,044,248

b. The value of company is the sum of the value of the firm's debt and equity. So, the value of Steinberg is:

$V_{Steinberg} = B + S$
$V_{Steinberg} = \$796{,}460 + 1{,}309{,}735$
$V_{Steinberg} = \$2{,}106{,}195$

And value of Dietrich is:

$V_{Dietrich} = B + S$
$V_{Dietrich} = \$1{,}044{,}248 + 1{,}061{,}947$
$V_{Dietrich} = \$2{,}106{,}195$

You should disagree with the CEO's statement. The risk of bankruptcy *per se* does not affect a firm's value. It is the actual costs of bankruptcy that decrease the value of a firm. Note that this problem assumes that there are no bankruptcy costs.

Question 3

Financial Distress Good Time Company is a regional chain department store. It will remain in business for one more year. The probability of a boom year is 60 percent and the probability of a recession is 40 percent. It is projected that the company will generate a total cash flow of $185 million in a boom year and $76 million in a recession. The company's required debt payment at the end of the year is $110 million. The market value of the company's outstanding debt is $83 million. The company pays no taxes.

a. What payoff do bondholders expect to receive in the event of a recession?
b. What is the promised return on the company's debt?
c. What is the expected return on the company's debt?

a. The expected payoff to bondholders is the face value of debt or the value of the company, whichever is less. Since the value of the company in a recession is $76,000,000 and the required debt payment in one year is $110,000,000, bondholders will receive the lesser amount, or $76,000,000.

b. The promised return on debt is:

Promised return = (Face value of debt / Market value of debt) – 1
Promised return = ($110,000,000 / $83,000,000) – 1
Promised return = .3253, or 32.56%

c. In part *a*, we determined bondholders will receive $76,000,000 in a recession. In a boom, the bondholders will receive the entire $110,000,000 promised payment since

the market value of the company is greater than the payment. So, the expected value of debt is:

Expected payment to bondholders = .60($110,000,000) + .40($76,000,000)
Expected payment to bondholders = $96,400,000

So, the expected return on debt is:

Expected return = (Expected value of debt / Market value of debt) – 1
Expected return = ($96,400,000 / $83,000,000) – 1
Expected return = .1614, or 16.14%

Chapter 18

Question 1

NPV and APV Zoso is a rental car company that is trying to determine whether to add 25 cars to its fleet. The company fully depreciates all its rental cars over five years using the straight-line method. The new cars are expected to generate $175,000 per year in earnings before taxes and depreciation for five years. The company is entirely financed by equity and has a 35 percent tax rate. The required return on the company's unlevered equity is 13 percent, and the new fleet will not change the risk of the company.

a. What is the maximum price that the company should be willing to pay for the new fleet of cars if it remains an all-equity company?

b. Suppose the company can purchase the fleet of cars for $480,000. Additionally, assume the company can issue $390,000 of five-year, 8 percent debt to finance the project. All principal will be repaid in one balloon payment at the end of the fifth year. What is the adjusted present value (APV) of the project?

a. The maximum price that the company should be willing to pay for the fleet of cars with all-equity funding is the price that makes the NPV of the transaction equal to zero. The NPV equation for the project is:

NPV = –Purchase Price + PV[(1 – t_C)(EBTD)] + PV(Depreciation Tax Shield)

If we let P equal the purchase price of the fleet, then the NPV is:

$NPV = -P + (1 - .35)(\$175{,}000)PVIFA_{13\%,5} + (.35)(P/5)PVIFA_{13\%,5}$

Setting the NPV equal to zero and solving for the purchase price, we find:

$0 = -P + (1 - .35)(\$175{,}000)PVIFA_{13\%,5} + (.35)(P/5)PVIFA_{13\%,5}$
$P = \$400{,}085.06 + (P)(.35/5)PVIFA_{13\%,5}$
$P = \$400{,}085.06 + .2462P$
$.7538P = \$400{,}085.06$
$P = \$530{,}761.93$

NI = (175000 – P/5)*(1-0.35)
OCF = NI+ Dep = (175000 – P/5)*(1-0.35) + P/5
$NPV = -P + [(175000 - P/5)*(1-0.35) + P/5] / 0.13 * (1 - 1/1.13^5] = 0$
P = $530,761.93

b. The adjusted present value (APV) of a project equals the net present value of the project if it were funded completely by equity plus the net present value of any financing side effects. In this case, the NPV of financing side effects equals the after-tax present value of the cash flows resulting from the firm's debt, so:

APV = NPV(All-Equity) + NPV(Financing Side Effects)
So, the NPV of each part of the APV equation is:

NPV(All-Equity)

NPV = –Purchase Price + PV[(1 – t_C)(EBTD)] + PV(Depreciation Tax Shield)

The company paid $480,000 for the fleet of cars. Because this fleet will be fully depreciated over five years using the straight-line method, annual depreciation expense equals:

Depreciation = $480,000/5
Depreciation = $96,000

So, the NPV of an all-equity project is:

NPV = –$480,000 + (1 – .35)($175,000)$PVIFA_{13\%,5}$ + (.35)($96,000)$PVIFA_{13\%,5}$
NPV = $38,264.03

NPV(Financing Side Effects)

The net present value of financing side effects equals the after-tax present value of cash flows resulting from the firm's debt, so:

NPV = Proceeds – Aftertax PV(Interest Payments) – PV(Principal Payments)

Given a known level of debt, debt cash flows should be discounted at the pre-tax cost of debt R_B. So, the NPV of the financing side effects are:

NPV = $390,000 – (1 – .35)(.08)($390,000)$PVIFA_{8\%,5}$ – $390,000/$1.08^5$
NPV = $43,600.39
NPV(Financing Side Effects) = PV(five year tax shield)
= (390000*0.08*0.35)/0.08*(1-1/1.08^5) = 43600.39

So, the APV of the project is:

APV = NPV(All-Equity) + NPV(Financing Side Effects)
APV = $38,264.03 + 43,600.39
APV = $81,864.42

Question 2

FTE Milano Pizza Club owns three identical restaurants popular for their specialty pizzas. Each restaurant has a debt–equity ratio of 40 percent and makes interest payments of $41,000 at the end of each year. The cost of the firm's levered equity is 19 percent. Each store estimates that annual sales will be $1.3 million; annual cost of goods sold will be $670,000; and annual general and administrative costs will be $405,000. These cash flows are expected to remain the same forever. The corporate tax rate is 40 percent.

a. Use the flow to equity approach to determine the value of the company's equity.
b. What is the total value of the company?

a. In order to value a firm's equity using the flow-to-equity approach, discount the cash flows available to equity holders at the cost of the firm's levered equity. The cash flows to equity holders will be the firm's net income. Remembering that the company has three stores, we find:

Sales	$3,900,000
COGS	2,010,000
G & A costs	1,215,000
Interest	123,000
EBT	$ 552,000
Taxes	220,800
NI	$ 331,200

Since this cash flow will remain the same forever, the present value of cash flows available to the firm's equity holders is a perpetuity. We can discount at the levered cost of equity, so, the value of the company's equity is:

PV(Flow-to-equity) = $331,200 / .19
PV(Flow-to-equity) = $1,743,157.89

b. The value of a firm is equal to the sum of the market values of its debt and equity, or:

$V_L = B + S$

We calculated the value of the company's equity in part *a*, so now we need to calculate the value of debt. The company has a debt-to-equity ratio of .40, which can be written algebraically as:

$B / S = .40$

We can substitute the value of equity and solve for the value of debt, doing so, we find:

B / $1,743,157.89 = .40
B = $697,263.16

So, the value of the company is:

V = $1,743,157.89 + 697,263.16
V = $2,440,421.05

Question 3

APV, FTE, and WACC Seger, Inc., is an unlevered firm with expected annual earnings before taxes of $21 million in perpetuity. The current required return on the firm's equity is 16 percent, and the firm distributes all of its earnings as dividends at the end of each year. The company has 1.3 million shares of common stock outstanding and is subject to a corporate tax rate of 35 percent. The firm is planning a recapitalization under which it will issue $30 million of perpetual 9 percent debt and use the proceeds to buy back shares.

a. Calculate the value of the company before the recapitalization plan is announced. What is the value of equity before the announcement? What is the price per share?
b. Use the APV method to calculate the company value after the recapitalization plan is announced. What is the value of equity after the announcement? What is the price per share?
c. How many shares will be repurchased? What is the value of equity after the repurchase has been completed? What is the price per share?
d. Use the flow to equity method to calculate the value of the company's equity after the recapitalization.

a. The company is currently an all-equity firm, so the value as an all-equity firm equals the present value of aftertax cash flows, discounted at the cost of the firm's unlevered cost of equity. So, the current value of the company is:

V_U = [(Pretax earnings)(1 – t_C)] / R_0
V_U = [($21,000,000)(1 – .35)] / .16
V_U = $85,312,500

The price per share is the total value of the company divided by the shares outstanding, or:

Price per share = $85,312,500 / 1,300,000
Price per share = $65.63

b. The adjusted present value of a firm equals its value under all-equity financing plus the net present value of any financing side effects. In this case, the NPV of financing

side effects equals the aftertax present value of cash flows resulting from the firm's debt. Given a known level of debt, debt cash flows can be discounted at the pretax cost of debt, so the NPV of the financing effects are:

NPV of Financing Side = Proceeds – Aftertax PV(Interest Payments)
NPV of Financing Side = $30,000,000 – (1 – .35)(.09)($30,000,000) / .09
NPV of Financing Side = $10,500,000
Also, NPV of Financing Side = 30000000* 0.35

So, the value of the company after the recapitalization using the APV approach is:

V = $85,312,500 + 10,500,000
V = $95,812,500

Since the company has not yet issued the debt, this is also the value of equity after the announcement. So, the new price per share will be:

New share price = $95,812,500 / 1,300,000
New share price = $73.70

c. The company will use the entire proceeds to repurchase equity. Using the share price we calculated in part *b*, the number of shares repurchased will be:

Shares repurchased = $30,000,000 / $73.70
Shares repurchased = 407,045

And the new number of shares outstanding will be:

New shares outstanding = 1,300,000 – 407,045
New shares outstanding = 892,955

The value of the company increased, but part of that increase will be funded by the new debt. The value of equity after recapitalization is the total value of the company minus the value of debt, or:

New value of equity = $95,812,500 – 30,000,000
New value of equity = $65,812,500

So, the price per share of the company after recapitalization will be:

New share price = $65,812,500 / 892,955
New share price = $73.70

The price per share is unchanged.

d. In order to value a firm's equity using the flow-to-equity approach, we must discount the cash flows available to equity holders at the cost of the firm's levered equity.

According to Modigliani-Miller Proposition II with corporate taxes, the required return of levered equity is:

$R_S = R_0 + (B/S)(R_0 - R_B)(1 - t_C)$
$R_S = .16 + (\$30{,}000{,}000 / \$65{,}812{,}500)(.16 - .09)(1 - .35)$
$R_S = .1807$, or 18.07%

After the recapitalization, the net income of the company will be:

EBIT	$21,000,000
Interest	2,700,000
EBT	$18,300,000
Taxes	6,405,000
Net income	$11,895,000

The firm pays all of its earnings as dividends, so the entire net income is available to shareholders. Using the flow-to-equity approach, the value of the equity is:

S = Cash flows available to equity holders / R_S
$S = \$11{,}895{,}000 / .1807$
$S = \$65{,}812{,}500$

Chapter 19

Question 1

Stock Splits and Stock Dividends Roll Corporation (RC) currently has 330,000 shares of stock outstanding that sell for $64 per share. Assuming no market imperfections or tax effects exist, what will the share price be after:

a. RC has a five-for-three stock split?
b. RC has a 15 percent stock dividend?
c. RC has a 42.5 percent stock dividend?
d. RC has a four-for-seven reverse stock split?

Determine the new number of shares outstanding in parts (a) through (d).

To find the new stock price, we multiply the current stock price by the ratio of old shares to new shares, so:

a. $64(3/5) = $38.40

b. $64(1/1.15) = $55.65

c. $64(1/1.425) = $44.91

d. $64(7/4) = $112.00

To find the new shares outstanding, we multiply the current shares outstanding times the ratio of new shares to old shares, so:

a: 330,000(5/3) = 550,000

b: 330,000(1.15) = 379,500

c: 330,000(1.425) = 470,250

d: 330,000(4/7) = 188,571

Question 2

Regular Dividends The balance sheet for Levy Corp. is shown here in market value terms. There are 12,000 shares of stock outstanding.

Market Value Balance Sheet			
Cash	$ 55,000	Equity	$465,000
Fixed assets	410,000		
Total	$465,000	Total	$465,000

The company has declared a dividend of $1.90 per share. The stock goes ex dividend tomorrow. Ignoring any tax effects, what is the stock selling for today? What will it sell for tomorrow? What will the balance sheet look like after the dividends are paid?

The stock price is the total market value of equity divided by the shares outstanding, so:

P_0 = $465,000 equity/12,000 shares = $38.75 per share

Ignoring tax effects, the stock price will drop by the amount of the dividend, so:

P_X = $38.75 – 1.90 = $36.85

The total dividends paid will be:

$1.90 per share(12,000 shares) = $22,800

The equity and cash accounts will both decline by $22,800.

Question 3

Share Repurchase In the previous problem, suppose Levy has announced it is going to repurchase $22,800 worth of stock. What effect will this transaction have on the equity of the firm? How many shares will be outstanding? What will the price per share be after the repurchase? Ignoring tax effects, show how the share repurchase is effectively the same as a cash dividend.

Repurchasing the shares will reduce shareholders' equity by $22,800. The shares repurchased will be the total purchase amount divided by the stock price, so:

Shares bought = $22,800/$38.75 = 588

And the new shares outstanding will be:

New shares outstanding = 12,000 – 588 = 11,412

After repurchase, the new stock price is:

Share price = $442,200/11,412 shares = $38.75

The repurchase is effectively the same as the cash dividend because you either hold a share worth $38.75 or a share worth $36.85 and $1.90 in cash. Therefore, you participate in the repurchase according to the dividend payout percentage; you are unaffected.

Question 4

Dividend Policy Gibson Co. has a current period cash flow of $1.1 million and pays no dividends. The present value of the company's future cash flows is $15 million. The company is entirely financed with equity and has 600,000 shares outstanding. Assume the dividend tax rate is zero.

a. What is the share price of the Gibson stock?
b. Suppose the board of directors of Gibson Co. announces its plan to pay out 50 percent of its current cash flow as cash dividends to its shareholders. How can Jeff Miller, who owns 1,000 shares of Gibson stock, achieve a zero payout policy on his own?

a. The current price is the current cash flow of the company plus the present value of the expected cash flows, divided by the number of shares outstanding. So, the current stock price is:

Stock price = ($1,100,000 + 15,000,000) / 600,000
Stock price = $26.83

b. To achieve a zero dividend payout policy, he can invest the dividends back into the company's stock. The dividends per share will be:

Dividends per share = [($1,100,000)(.50)]/600,000
Dividends per share = $0.92

And the stockholder in question will receive:

Dividends paid to shareholder = $0.92(1,000)

Dividends paid to shareholder = $916.67

The new stock price after the dividends are paid will be:

Ex-dividend stock price = $26.83 – 0.92
Ex-dividend stock price = $25.92

So, the number of shares the investor will buy is:

Number of shares to buy = $916.67 / $25.92
Number of shares to buy = 35.37