CHAPTER 13
RISK, COST OF CAPITAL, AND CAPITAL BUDGETING

Answers to Concepts Review and Critical Thinking Questions

1. No. The cost of capital depends on the risk of the project, not the source of the money.

2. Interest expense is tax-deductible. There is no difference between pretax and aftertax equity costs.

3. You are assuming that the new project's risk is the same as the risk of the firm as a whole, and that the firm is financed entirely with equity.

4. Two primary advantages of the SML approach are that the model explicitly incorporates the relevant risk of the stock and the method is more widely applicable than is the DCF model, since the SML doesn't make any assumptions about the firm's dividends. The primary disadvantages of the SML method are (1) three parameters (the risk-free rate, the expected return on the market, and beta) must be estimated, and (2) the method essentially uses historical information to estimate these parameters. The risk-free rate is usually estimated to be the yield on very short maturity T-bills and is, hence, observable; the market risk premium is usually estimated from historical risk premiums and, hence, is not observable. The stock beta, which is unobservable, is usually estimated either by determining some average historical beta from the firm and the market's return data, or by using beta estimates provided by analysts and investment firms.

5. The appropriate aftertax cost of debt to the company is the interest rate it would have to pay if it were to issue new debt today. Hence, if the YTM on outstanding bonds of the company is observed, the company has an accurate estimate of its cost of debt. If the debt is privately-placed, the firm could still estimate its cost of debt by (1) looking at the cost of debt for similar firms in similar risk classes, (2) looking at the average debt cost for firms with the same credit rating (assuming the firm's private debt is rated), or (3) consulting analysts and investment bankers. Even if the debt is publicly traded, an additional complication arises when the firm has more than one issue outstanding; these issues rarely have the same yield because no two issues are ever completely homogeneous.

6. *a.* This only considers the dividend yield component of the required return on equity.
b. This is the current yield only, not the promised yield to maturity. In addition, it is based on the book value of the liability, and it ignores taxes.
c. Equity is inherently riskier than debt (except, perhaps, in the unusual case where a firm's assets have a negative beta). For this reason, the cost of equity exceeds the cost of debt. If taxes are considered in this case, it can be seen that at reasonable tax rates, the cost of equity does exceed the cost of debt.

7. R_{Sup} = .12 + .75(.08) = .1800 or 18.00%

Both should proceed. The appropriate discount rate does not depend on which company is investing; it depends on the risk of the project. Since Superior is in the business, it is closer to a pure play. Therefore, its cost of capital should be used. With an 18% cost of capital, the project has an NPV of $1 million regardless of who takes it.

8. If the different operating divisions were in much different risk classes, then separate cost of capital figures should be used for the different divisions; the use of a single, overall cost of capital would be inappropriate. If the single hurdle rate were used, riskier divisions would tend to receive more funds for investment projects, since their return would exceed the hurdle rate despite the fact that they may actually plot below the SML and, hence, be unprofitable projects on a risk-adjusted basis. The typical problem encountered in estimating the cost of capital for a division is that it rarely has its own securities traded on the market, so it is difficult to observe the market's valuation of the risk of the division. Two typical ways around this are to use a pure play proxy for the division, or to use subjective adjustments of the overall firm hurdle rate based on the perceived risk of the division.

9. The discount rate for the projects should be lower that the rate implied by the security market line. The security market line is used to calculate the cost of equity. The appropriate discount rate for projects is the firm's weighted average cost of capital. Since the firm's cost of debt is generally less that the firm's cost of equity, the rate implied by the security market line will be too high.

10. Beta measures the responsiveness of a security's returns to movements in the market. Beta is determined by the cyclicality of a firm's revenues. This cyclicality is magnified by the firm's operating and financial leverage. The following three factors will impact the firm's beta. (1) Revenues. The cyclicality of a firm's sales is an important factor in determining beta. In general, stock prices will rise when the economy expands and will fall when the economy contracts. As we said above, beta measures the responsiveness of a security's returns to movements in the market. Therefore, firms whose revenues are more responsive to movements in the economy will generally have higher betas than firms with less-cyclical revenues. (2) Operating leverage. Operating leverage is the percentage change in earnings before interest and taxes (EBIT) for a percentage change in sales. A firm with high operating leverage will have greater fluctuations in EBIT for a change in sales than a firm with low operating leverage. In this way, operating leverage magnifies the cyclicality of a firm's revenues, leading to a higher beta. (3) Financial leverage. Financial leverage arises from the use of debt in the firm's capital structure. A levered firm must make fixed interest payments regardless of its revenues. The effect of financial leverage on beta is analogous to the effect of operating leverage on beta. Fixed interest payments cause the percentage change in net income to be greater than the percentage change in EBIT, magnifying the cyclicality of a firm's revenues. Thus, returns on highly-levered stocks should be more responsive to movements in the market than the returns on stocks with little or no debt in their capital structure.

Solutions to Questions and Problems

NOTE: All end-of-chapter problems were solved using a spreadsheet. Many problems require multiple steps. Due to space and readability constraints, when these intermediate steps are included in this solutions manual, rounding may appear to have occurred. However, the final answer for each problem is found without rounding during any step in the problem.

<u>*Basic*</u>

1. With the information given, we can find the cost of equity using the CAPM. The cost of equity is:

R_S = .035 + 1.21(.11 – .035) = .1258, or 12.58%

2. The pretax cost of debt is the YTM of the company's bonds, so:

P_0 = \$950 = \$40($PVIFA_{R\%,34}$) + \$1,000($PVIF_{R\%,34}$)
R = 4.282%
R_B = 2 × 4.282% = 8.56%

And the aftertax cost of debt is:

Aftertax cost of debt = 8.56%(1 – .35) = 5.57%

3. *a.* The pretax cost of debt is the YTM of the company's bonds, so:

P_0 = \$1,080 = \$31.50($PVIFA_{R\%,46}$) + \$1,000($PVIF_{R\%,46}$)
R = 2.789%
R_B = 2 × 2.789% = 5.58%

b. The aftertax cost of debt is:

Aftertax cost of debt = 5.58%(1 – .35) = 3.63%

c. The aftertax rate is more relevant because that is the actual cost to the company.

4. The book value of debt is the total par value of all outstanding debt, so:

BV_B = \$70,000,000 + 100,000,000 = \$170,000,000

To find the market value of debt, we find the price of the bonds and multiply by the number of bonds. Alternatively, we can multiply the price quote of the bond times the par value of the bonds. Doing so, we find:

B = 1.08(\$70,000,000) + .61(\$100,000,000) = \$136,600,000

The YTM of the zero coupon bonds is:

P_Z = \$610 = \$1,000($PVIF_{R\%,24}$)
R = 2.081%
YTM = 2 × 2.081% = 4.16%

So, the aftertax cost of the zero coupon bonds is:

Aftertax cost of debt = 4.16%(1 – .35) = 2.71%

The aftertax cost of debt for the company is the weighted average of the aftertax cost of debt for all outstanding bond issues. We need to use the market value weights of the bonds. The total aftertax cost of debt for the company is:

Aftertax cost of debt = .0363[1.08($70)/$136.6] + .0271[.61($100)/$136.6) = .0321, or 3.21%

5. Using the equation to calculate the WACC, we find:

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

6. Here we need to use the debt-equity ratio to calculate the WACC. Doing so, we find:

R_{WACC} = .14(1/1.55) + .07(.55/1.55)(1 – .35) = .1065, or 10.65%

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

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

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:

$V/S = 1 + B/S$

$.0980(B/\text{S} + 1) = .13 + .04225(B/S)$

Now we can solve for B/S as:

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

8. *a.* The book value of equity is the book value per share times the number of shares, and the book value of debt is the face value of the company's debt, so:

Equity = 8,300,000($4) = $33,200,000

Debt = $70,000,000 + 60,000,000 = $130,000,000

So, the total book value of the company is:

Book value = $33,200,000 + 130,000,000 = $163,200,000

And the book value weights of equity and debt are:

Equity/Value = \$33,200,000/\$163,200,000 = .2034

Debt/Value = 1 – Equity/Value = .7966

b. The market value of equity is the share price times the number of shares, so:

S = 8,300,000(\$53) = \$439,900,000

Using the relationship that the total market value of debt is the price quote times the par value of the bond, we find the market value of debt is:

B = 1.083(\$70,000,000) + 1.089(\$60,000,000) = \$141,150,000

This makes the total market value of the company:

V = \$439,900,000 + 141,150,000 = \$581,050,000

And the market value weights of equity and debt are:

S/V = \$439,900,000/\$581,050,000 = .7571

$B/V = 1 – S/V$ = .2429

c. The market value weights are more relevant.

9. First, we will find the cost of equity for the company. The information provided allows us to solve for the cost of equity using the CAPM, so:

R_S = .031 + 1.2(.07) = .1150, or 11.50%

Next, we need to find the YTM on both bond issues. Doing so, we find:

P_1 = \$1,083 = \$35($PVIFA_{R\%,16}$) + \$1,000($PVIF_{R\%,16}$)
R = 2.847%
YTM = 2.847% × 2 = 5.69%

P_2 = \$1,089 = \$37.50($PVIFA_{R\%,54}$) + \$1,000($PVIF_{R\%,54}$)
R = 3.389%
YTM = 3.389% × 2 = 6.78%

To find the weighted average aftertax cost of debt, we need the weight of each bond as a percentage of the total debt. We find:

X_{B1} = 1.083(\$70,000,000)/\$141,150,000 = .537

X_{B2} = 1.089(\$60,000,000)/\$141,150,000 = .463

Now we can multiply the weighted average cost of debt times one minus the tax rate to find the weighted average aftertax cost of debt. This gives us:

$R_B = (1 – .35)[(.537)(.0569) + (.463)(.0678)] = .0403$, or 4.03%

Using these costs and the weight of debt we calculated earlier, the WACC is:

$R_{\text{WACC}} = .7571(.1150) + .2429(.0403) = .0968$, or 9.68%

10. *a.* Using the equation to calculate WACC, we find:

$R_{\text{WACC}} = .112 = (1/1.45)(.15) + (.45/1.45)(1 – .35)R_{\text{B}}$
$R_B = .0424$, or 4.24%

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

$R_{\text{WACC}} = .112 = (1/1.45)R_{\text{S}} + (.45/1.45)(.064)$
$R_S = .1336$, or 13.36%

11. We will begin by finding the market value of each type of financing. We find:

$B = 5{,}000(\$1{,}000)(1.05) = \$5{,}250{,}000$
$S = 175{,}000(\$58) = \$10{,}150{,}000$

And the total market value of the firm is:

$V = \$5{,}250{,}000 + 10{,}150{,}000 = \$15{,}400{,}000$

Now, we can find the cost of equity using the CAPM. The cost of equity is:

$R_S = .05 + 1.10(.07) = .1270$, or 12.70%

The cost of debt is the YTM of the bonds, so:

$\text{P}_0 = \$1{,}050 = \$30(\text{PVIFA}_{R\%,50}) + \$1{,}000(\text{PVIF}_{R\%,50})$
$R = 2.813\%$
$\text{YTM} = 2.813\% \times 2 = 5.63\%$

And the aftertax cost of debt is:

$R_B = (1 – .35)(.0563) = .0366$, or 3.66%

Now we have all of the components to calculate the WACC. The WACC is:

$R_{\text{WACC}} = .0366(\$5{,}250{,}000/\$15{,}400{,}000) + .1270(\$10{,}150{,}000/\$15{,}400{,}000) = .0962$, or 9.62%

Notice that we didn't include the $(1 – t_C)$ term in the WACC equation. We simply used the aftertax cost of debt in the equation, so the term is not needed here.

12. *a.* We will begin by finding the market value of each type of financing. We find:

B = 260,000($1,000)(1.04) = $270,400,000
S = 9,300,000($34) = $316,200,000

And the total market value of the firm is:

V = $270,400,000 + 316,200,000 = $586,600,000

So, the market value weights of the company's financing is:

B/V = $270,400,000/$586,600,000 = .4610
S/V = $316,200,000/$586,600,000 = .5390

b. For projects equally as risky as the firm itself, the WACC should be used as the discount rate.

First we can find the cost of equity using the CAPM. The cost of equity is:

$R_S = .035 + 1.20(.07) = .1190$, or 11.90%

The cost of debt is the YTM of the bonds, so:

$P_0 = \$1,040 = \$34(\text{PVIFA}_{R\%,40}) + \$1,000(\text{PVIF}_{R\%,40})$
R = 3.221%
YTM = 3.221% × 2 = 6.44%

And the aftertax cost of debt is:

$R_B = (1 - .35)(.0644) = .0419$, or 4.19%

Now we can calculate the WACC as:

$R_{WACC} = .5390(.1190) + .4610(.0419) = .0834$, or 8.34%

13. *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.

14. *a.* He should look at the weighted average flotation cost, not just the debt cost.

b. The weighted average flotation cost is the weighted average of the flotation costs for debt and equity, so:

f_T = .03(.75/1.75) + .07(1/1.75) = .0529, or 5.29%

c. The total cost of the equipment including flotation costs is:

Amount raised(1 – .0529) = $20,000,000
Amount raised = $20,000,000/(1 – .0529) = $21,116,139

Even if the specific funds are actually being raised completely from debt, the flotation costs, and hence true investment cost, should be valued as if the firm's target capital structure is used.

15. We first need to find the weighted average flotation cost. Doing so, we find:

f_T = .65(.08) + .05(.05) + .30(.03) = .064, or 6.4%

And the total cost of the equipment including flotation costs is:

Amount raised(1 – .064) = $55,000,000
Amount raised = $55,000,000/(1 – .064) = $58,729,311

Intermediate

16. Using the debt-equity ratio to calculate the WACC, we find:

R_{WACC} = (.55/1.55)(.055) + (1/1.55)(.13) = .1034, or 10.34%

Since the project is riskier than the company, we need to adjust the project discount rate for the additional risk. Using the subjective risk factor given, we find:

Project discount rate = 10.34% + 2% = 12.34%

We would accept the project if the NPV is positive. The NPV is the PV of the cash outflows plus the PV of the cash inflows. Since we have the costs, we just need to find the PV of inflows. The cash inflows are a growing perpetuity. If you remember, the equation for the PV of a growing perpetuity is the same as the dividend growth equation, so:

PV of future CF = $3,500,000/(.1234 – .04) = $41,972,921

The project should only be undertaken if its cost is less than $41,972,921 since costs less than this amount will result in a positive NPV.

17. We will begin by finding the market value of each type of financing. We will use B1 to represent the coupon bond, and B2 to represent the zero coupon bond. So, the market value of the firm's financing is:

B_{B1} = 60,000($1,000)(1.095) = $65,700,000
B_{B2} = 230,000($1,000)(.175) = $40,250,000
P = 150,000($79) = $11,850,000
S = 2,600,000($65) = $169,000,000

And the total market value of the firm is:

V = $65,700,000 + 40,250,000 + 11,850,000 + 169,000,000 = $286,800,000

Now, we can find the cost of equity using the CAPM. The cost of equity is:

R_S = .04 + 1.15(.07) = .1205, or 12.05%

The cost of debt is the YTM of the bonds, so:

P_0 = $1,095 = $30($PVIFA_{R\%,40}$) + $1,000($PVIF_{R\%,40}$)
R = 2.614%
YTM = 2.614% × 2 = 5.23%

And the aftertax cost of debt is:

R_{B1} = (1 – .40)(.0523) = .0314, or 3.14%

And the aftertax cost of the zero coupon bonds is:

P_0 = $175 = $1,000($PVIF_{R\%,60}$)
R = 2.948%
YTM = 2.948% × 2 = 5.90%

R_{B2} = (1 – .40)(.0590) = .0354, or 3.54%

Even though the zero coupon bonds make no payments, the calculation for the YTM (or price) still assumes semiannual compounding, consistent with a coupon bond. Also remember that, even though the company does not make interest payments, the accrued interest is still tax deductible for the company.

To find the required return on preferred stock, we can use the preferred stock pricing equation, which is the level perpetuity equation, so the required return on the company's preferred stock is:

$R_P = D_1 / P_0$
R_P = $4 / $79
R_P = .0506, or 5.06%

Notice that the required return in the preferred stock is lower than the required on the bonds. This result is not consistent with the risk levels of the two instruments, but is a common occurrence. There is a practical reason for this: Assume Company A owns stock in Company B. The tax code allows Company A to exclude at least 70 percent of the dividends received from Company B, meaning Company A does not pay taxes on this amount. In practice, much of the outstanding preferred stock is owned by other companies, who are willing to take the lower return since much of the return is effectively tax exempt for the investing company.

Now we have all of the components to calculate the WACC. The WACC is:

R_{WACC} = .0314($65,700,000/$286,800,000) + .0354($40,250,000/$286,800,000)
+ .1205($169,000,000/$286,800,000) + .0506($11,850,000/$286,800,000)
R_{WACC} = .0852, or 8.52%

18. The total cost of the equipment including flotation costs was:

Total costs = $19,000,000 + 1,150,000 = $20,150,000

Using the equation to calculate the total cost including flotation costs, we get:

Amount raised$(1 - f_{\text{T}})$ = Amount needed after flotation costs
$20,150,000$(1 - f_{\text{T}})$ = $19,000,000
f_{T} = .0571, or 5.71%

Now, we know the weighted average flotation cost. The equation to calculate the percentage flotation costs is:

$f_{\text{T}} = .0571 = .07(S/V) + .03(B/V)$

We can solve this equation to find the debt-equity ratio as follows:

$.0571(V/S) = .07 + .03(B/S)$

We must recognize that the V/S term is the equity multiplier, which is $(1 + B/S)$, so:

$.0571(B/S + 1) = .07 + .03(B/S)$
$B/S = .4775$

19. *a.* Using the dividend discount model, the cost of equity is:

R_S = [(0.95)(1.045)/$64] + .045
R_S = .0605, or 6.05%

b. Using the CAPM, the cost of equity is:

$R_S = .043 + 1.30(.11 - .043)$
R_S = .1301, or 13.01%

c. When using the dividend growth model or the CAPM, you must remember that both are estimates for the cost of equity. Additionally, and perhaps more importantly, each method of estimating the cost of equity depends upon different assumptions.

20. We are given the total cash flow for the current year. To value the company, we need to calculate the cash flows until the growth rate levels off at a constant perpetual rate. So, the cash flows each year will be:

Year 1: $7,500,000(1 + .08) = $8,100,000
Year 2: $8,100,000(1 + .08) = $8,748,000
Year 3: $8,748,000(1 + .08) = $9,447,840
Year 4: $9,447,840(1 + .08) = $10,203,667
Year 5: $10,203,667(1 + .08) = $11,019,961
Year 6: $11,019,961(1 + .04) = $11,460,759

We can calculate the terminal value in Year 5 since the cash flows begin a perpetual growth rate. Since we are valuing Arras, we need to use the cost of capital for that company since this rate is based on the risk of Arras. The cost of capital for Schultz is irrelevant in this case. So, the terminal value is:

$TV_5 = CF_6 / (R_{WACC} – g)$
TV_5 = $11,460,759 / (.10 – .04)
TV_5 = $191,012,650

Now we can discount the cash flows for the first 5 years as well as the terminal value back to today. Again, using the cost of capital for Arras, we find the value of the company today is:

V_0 = $8,100,000 / 1.08 + $8,748,000 / 1.08^2 + $9,447,840 / 1.08^3 + $10,203,667 / 1.08^4
+ ($11,019,961 + 191,012,650) / 1.08^5
V_0 = $154,107,288

The market value of the equity is the market value of the company minus the market value of the debt, or:

S = $154,107,288 – 25,000,000
S = $129,107,288

To find the maximum offer price, we divide the market value of equity by the shares outstanding, or:

Share price = $129,107,288 / 3,000,000
Share price = $43.04

21. *a.* To begin the valuation of Joe's, we will begin by calculating the R_{WACC} for Happy Times. Since both companies are in the same industry, it is likely that the R_{WACC} for both companies will be the same. The weights of debt and equity are:

X_B = $140,000,000 / ($140,000,000 + 380,000,000) = .2692, or 26.92%
X_S = $380,000,000 / ($140,000,000 + 380,000,000) = .7308, or 73.08%

The R_{WACC} for Happy Times is:

R_{WACC} = .2692(.06)(1 – .38) + .7308(.11) = .0904, or 9.04%

Next, we need to calculate the cash flows for each year. The EBIT will grow at 10 percent per year for 5 years. Net working capital, capital spending, and depreciation are 9 percent, 15 percent, and 8 percent of EBIT, respectively. So, the cash flows for each year over the next 5 years will be:

	Year 1	*Year 2*	*Year 3*	*Year 4*	*Year 5*
EBIT	$12,500,000	$13,750,000	$15,125,000	$16,637,500	$18,301,250
Taxes	4,750,000	5,225,000	5,747,500	6,322,250	6,954,475
Net income	$7,750,000	$8,525,000	$9,377,500	$10,315,250	$11,346,775
Depreciation	1,000,000	1,100,000	1,210,000	1,331,000	1,464,100
OCF	$8,750,000	$9,625,000	$10,587,500	$11,646,250	$12,810,875
– Capital spending	1,875,000	2,062,500	2,268,750	2,495,625	2,745,188
– Change in NWC	1,125,000	1,237,500	1,361,250	1,497,375	1,647,113
Cash flow from assets	$5,750,000	$6,325,000	$6,957,500	$7,653,250	$8,418,575

After Year 5 the cash flows will grow at 3 percent in perpetuity. We can find the terminal value of the company in Year 5 using the cash flow in Year 6 as:

$TV_5 = CF_6 / (R_{WACC} - g)$
$TV_5 = \$8,418,575(1 + .03) / (.0904 - .03)$
$TV_5 = \$143,561,792$

Now we can discount the cash flows and terminal value to today. Doing so, we find:

$V_0 = \$5,750,000 / 1.0904 + \$6,325,000 / 1.0904^2 + \$6,957,500 / 1.0904^3$
$\quad + \$7,653,250 / 1.0904^4 + (\$8,418,575 + 143,561,792) / 1.0904^5$
$V_0 = \$119,969,144$

The market value of the equity is the market value of the company minus the market value of the debt, or:

$S = \$119,969,144 - 30,500,000$
$S = \$89,469,144$

To find the maximum offer price, we divide the market value of equity by the shares outstanding, or:

Share price = $89,469,144 / 1,850,000
Share price = $48.36

b. To calculate the terminal value using the EV/EBITDA multiple we need to calculate the Year 5 EBITDA, which is EBIT plus depreciation, or:

EBITDA = $18,301,250 + 1,464,100
EBITDA = $19,765,350

We can now calculate the terminal value of the company using the Year 5 EBITDA, which will be:

TV_5 = \$19,765,350(8)
TV_5 = \$158,122,800

Note, this is the terminal value in Year 5 since we used the Year 5 EBITDA. We need to calculate the present value of the cash flows for the first 4 years, plus the present value of the Year 5 terminal value. We do not need to include the Year 5 cash flow since it is included in the Year 5 terminal value. So, the value of the company today is:

$$V_0 = \$5,750,000 / 1.0904 + \$6,325,000 / 1.0904^2 + \$6,957,500 / 1.0904^3 + \$7,653,250 / 1.0904^4 + \$158,122,800 / 1.0904^5$$
$$V_0 = \$123,953,986$$

The market value of the equity is the market value of the company minus the market value of the debt, or:

S = \$123,953,986 – 30,500,000
S = \$93,453,986

To find the maximum offer price, we divide the market value of equity by the shares outstanding, or:

Share price = \$93,453,986 / 1,850,000
Share price = \$50.52

Challenge

22. 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:

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

Solving for WACC, we find:

$$R_{\text{WACC}} = .0903 + .3548[(.20/1.2)R_{\text{WACC}} + .0433]$$
$$R_{\text{WACC}} = .0903 + (.0591)R_{\text{WACC}} + .0154$$
$$(.9409)R_{\text{WACC}} = .1057$$
$$R_{\text{WACC}} = .1123, \text{ or } 11.23\%$$

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

23. 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

24. The $7.5 million cost of the land 3 years ago is a sunk cost and irrelevant; the $7.1 million appraised value of the land is an opportunity cost and is relevant. The $7.4 million land value in 5 years is a relevant cash flow as well. The fact that the company is keeping the land rather than selling it is unimportant. The land is an opportunity cost in 5 years and is a relevant cash flow for this project. The market value capitalization weights are:

B = 260,000($1,000)(1.03) = $267,800,000
S = 9,500,000($67) = $636,500,000
P = 450,000($84) = $37,800,000

The total market value of the company is:

V = $267,800,000 + 636,500,000 + 37,800,000 = $942,100,000

The weight of each form of financing in the company's capital structure is:

X_B = $267,800,000 / $942,100,000 = .2843
X_S = $636,500,000 / $942,100,000 = .6756
X_B = $37,800,000 / $942,100,000 = .0401

Next we need to find the cost of funds. We have the information available to calculate the cost of equity using the CAPM, so:

$R_S = .036 + 1.25(.07) = .1235$, or 12.35%

The cost of debt is the YTM of the company's outstanding bonds, so:

$P_0 = \$1,030 = \$34(\text{PVIFA}_{R\%,50}) + \$1,000(\text{PVIF}_{R\%,50})$
R = 3.277%
YTM = 3.277% × 2 = 6.55%

And the aftertax cost of debt is:

$R_B = (1 – .35)(.0655) = .0426$, or 4.26%

The cost of preferred stock is:

$R_P = \$5.25/\$84 = .0625$, or 6.25%

a. The weighted average flotation cost is the sum of the weight of each source of funds in the capital structure of the company times the flotation costs, so:

f_T = .6756(.065) + .2843(.03) + .0401(.045) = .0542, or 5.42%

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

Amount raised(1 – .0542) = $40,000,000
Amount raised = $40,000,000/(1 – .0542) = $42,294,408

So the cash flow at time zero will be:

CF_0 = –$7,100,000 – 42,294,408 – 1,400,000 = –$50,794,408

There is an important caveat to this solution. This solution assumes that the increase in net working capital does not require the company to raise outside funds; therefore the flotation costs are not included. However, this is an assumption and the company could need to raise outside funds for the NWC. If this is true, the initial cash outlay includes these flotation costs, so:

Total cost of NWC including flotation costs:

$1,400,000/(1 – .0542) = $1,480,304

This would make the total initial cash flow:

CF_0 = –$7,100,000 – 42,294,408 – 1,480,304 = –$50,874,712

b. To find the required return on this project, we first need to calculate the WACC for the company. The company's WACC is:

R_{WACC} = .6756(.1235) + .2843(.0426) + .0401(.0625)] = .0981, or 9.81%

The company wants to use the subjective approach to this project because it is located overseas. The adjustment factor is 2 percent, so the required return on this project is:

Project required return = 9.81% + 2% = 11.81%

c. The annual depreciation for the equipment will be:

$40,000,000/8 = $5,000,000

So, the book value of the equipment at the end of five years will be:

BV_5 = $40,000,000 – 5($5,000,000) = $15,000,000

So, the aftertax salvage value will be:

Aftertax salvage value = $8,500,000 + .35($15,000,000 – 8,500,000) = $10,775,000 *d.* Using the tax shield approach, the OCF for this project is:

$$OCF = [(P - v)Q - FC](1 - t_C) + t_C D$$
$$OCF = [(\$10,900 - 9,450)(18,000) - 7,900,000](1 - .35) + .35(\$40,000,000/8) = \$13,580,000$$

e. The accounting breakeven sales figure for this project is:

$$Q_A = (FC + D)/(P - v) = (\$7,900,000 + 5,000,000)/(\$10,900 - 9,450) = 8,897 \text{ units}$$

f. We have calculated all cash flows of the project. We just need to make sure that in Year 5 we add back the aftertax salvage value and the recovery of the initial NWC. The cash flows for the project are:

Year	*Flow Cash*
0	–$50,794,408
1	13,580,000
2	13,580,000
3	13,580,000
4	13,580,000
5	33,155,000

Using the required return of 11.81 percent, the NPV of the project is:

$$NPV = -\$50,794,408 + \$13,580,000(PVIFA_{11.81\%,4}) + \$33,155,000/1.1181^5$$
$$NPV = \$9,599,239.56$$

And the IRR is:

$$NPV = 0 = -\$50,794,408 + \$13,580,000(PVIFA_{IRR\%,4}) + \$33,155,000/(1 + IRR)^5$$
$$IRR = 18.17\%$$

If the initial NWC is assumed to be financed from outside sources, the cash flows are:

Year	*Flow Cash*
0	–$50,874,712
1	13,580,000
2	13,580,000
3	13,580,000
4	13,580,000
5	33,155,000

With this assumption, and the required return of 11.81 percent, the NPV of the project is:

$$NPV = -\$50,874,712 + \$13,580,000(PVIFA_{11.81\%,4}) + \$33,155,000/1.1181^5$$
$$NPV = \$9,518,935.29$$

And the IRR is:

$$NPV = 0 = -\$50,874,712 + \$13,580,000(PVIFA_{IRR\%,4}) + \$33,155,000/(1 + IRR)^5$$
$$IRR = 18.11\%$$