CHAPTER 18
VALUATION AND CAPITAL BUDGETING FOR THE LEVERED FIRM

Answers to Concepts Review and Critical Thinking Questions

1. APV is equal to the NPV of the project (i.e. the value of the project for an unlevered firm) plus the NPV of financing side effects.

2. The WACC is based on a target debt level while the APV is based on the amount of debt.

3. FTE uses levered cash flow and other methods use unlevered cash flow.

4. The WACC method does not explicitly include the interest cash flows, but it does implicitly include the interest cost in the WACC. If he insists that the interest payments are explicitly shown, you should use the FTE method.

5. You can estimate the unlevered beta from a levered beta. The unlevered beta is the beta of the assets of the firm; as such, it is a measure of the business risk. Note that the unlevered beta will always be lower than the levered beta (assuming the betas are positive). The difference is due to the leverage of the company. Thus, the second risk factor measured by a levered beta is the financial risk of the company.

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.

Basic

1. *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)($140,000)$PVIFA_{13\%,5}$ + (.35)(P/5)$PVIFA_{13\%,5}$

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

$0 = -P + (1 - .35)(\$140,000)\text{PVIFA}_{13\%,5} + (.35)(P/5)\text{PVIFA}_{13\%,5}$
$P = \$320,068.04 + (P)(0.35/5)\text{PVIFA}_{13\%,5}$
$P = \$320,068.04 + .2462P$
$.7538P = \$320,068.04$
$P = \$424,609.54$

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:

<u>NPV(All-Equity)</u>

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

The company paid $395,000 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 = $395,000/5
Depreciation = $79,000

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

$NPV = -\$395,000 + (1 - 0.35)(\$140,000)\text{PVIFA}_{13\%,5} + (0.35)(\$79,000)\text{PVIFA}_{13\%,5}$
NPV = $22,319.49

<u>NPV(Financing Side Effects)</u>

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:

$NPV = \$260,000 - (1 - 0.35)(0.08)(\$260,000)\text{PVIFA}_{8\%,5} - [\$260,000/(1.08)^5]$
NPV = $29,066.93

So, the APV of the project is:

APV = NPV(All-Equity) + NPV(Financing Side Effects)
APV = $22,319.49 + 29,066.93
APV = $51,386.42

2. 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:

<u>NPV(All-Equity)</u>

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

Since the initial investment of $1.9 million will be fully depreciated over four years using the straight-line method, annual depreciation expense is:

Depreciation = $1,900,000/4
Depreciation = $475,000

NPV = –$1,900,000 + (1 – 0.30)($685,000)$PVIFA_{9.5\%,4}$ + (0.30)($475,000)$PVIFA_{13\%,4}$
NPV (All-equity) = – $49,878.84

<u>NPV(Financing Side Effects)</u>

The net present value of financing side effects equals the aftertax present value of cash flows resulting from the firm's debt. So, the NPV of the financing side effects are:

NPV = Proceeds(Net of flotation) – Aftertax PV(Interest Payments) – PV(Principal Payments)
+ PV(Flotation Cost Tax Shield)

Given a known level of debt, debt cash flows should be discounted at the pre-tax cost of debt, R_B. Since the flotation costs will be amortized over the life of the loan, the annual flotation costs that will be expensed each year are:

Annual flotation expense = $28,000/4
Annual flotation expense = $7,000

NPV = ($1,900,000 – 28,000) – (1 – 0.30)(0.095)($1,900,000)$PVIFA_{9.5\%,4}$ – $1,900,000/$(1.095)^4$
+ 0.30($7,000) $PVIFA_{9.5\%,4}$
NPV = $152,252.06

So, the APV of the project is:

APV = NPV(All-Equity) + NPV(Financing Side Effects)
APV = –$49,878.84 + 152,252.06
APV = $102,373.23

3. *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	$3,600,000
COGS	1,530,000
G & A costs	1,020,000
Interest	102,000
EBT	$948,000
Taxes	379,200
NI	$568,800

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) = $568,800 / 0.19
PV(Flow-to-equity) = $2,993,684.21

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 0.40, which can be written algebraically as:

B / S = 0.40

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

B / $2,993,684.21 = 0.40
B = $1,197,473.68

So, the value of the company is:

V = $2,993,684.21 + 1,197,473.68
V = $4,191,157.89

4. *a.* In order to determine the cost of the firm's debt, we need to find the yield to maturity on its current bonds. With semiannual coupon payments, the yield to maturity in the company's bonds is:

$975 = $40($PVIFA_{R\%,40}$) + $1,000($PVIF_{R\%,40}$)
R = .0413 or 4.13%

Since the coupon payments are semiannual, the YTM on the bonds is:

YTM = 4.13%× 2
YTM = 8.26%

b. We can use the Capital Asset Pricing Model to find the return on unlevered equity. According to the Capital Asset Pricing Model:

$R_0 = R_F + \beta_{Unlevered}(R_M - R_F)$
$R_0 = 5\% + 1.1(12\% - 5\%)$
$R_0 = 12.70\%$

Now we can find the cost of levered equity. According to Modigliani-Miller Proposition II with corporate taxes

$R_S = R_0 + (B/S)(R_0 - R_B)(1 - t_C)$
$R_S = .1270 + (.40)(.1270 - .0826)(1 - .34)$
$R_S = .1387$ or 13.87%

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

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

The problem does not provide either the debt-value ratio or equity-value ratio. However, the firm's debt-equity ratio of is:

B/S = 0.40

Solving for B:

B = 0.4S

Substituting this in the debt-value ratio, we get:

B/V = .4S / (.4S + S)
B/V = .4 / 1.4
B/V = .29

And the equity-value ratio is one minus the debt-value ratio, or:

S/V = 1 – .29
S/V = .71

So, the WACC for the company is:

$R_{WACC} = .29(1 - .34)(.0826) + .71(.1387)$
$R_{WACC} = .1147$ or 11.47%

5. *a.* The equity beta of a firm financed entirely by equity is equal to its unlevered beta. Since each firm has an unlevered beta of 1.25, we can find the equity beta for each. Doing so, we find:

North Pole

$\beta_{Equity} = [1 + (1 – t_C)(B/S)]\beta_{Unlevered}$
$\beta_{Equity} = [1 + (1 – .35)(\$2,900,000/\$3,800,000](1.25)$
$\beta_{Equity} = 1.87$

South Pole

$\beta_{Equity} = [1 + (1 – t_C)(B/S)]\beta_{Unlevered}$
$\beta_{Equity} = [1 + (1 – .35)(\$3,800,000/\$2,900,000](1.25)$
$\beta_{Equity} = 2.31$

b. We can use the Capital Asset Pricing Model to find the required return on each firm's equity. Doing so, we find:

North Pole:

$R_S = R_F + \beta_{Equity}(R_M – R_F)$
$R_S = 5.30\% + 1.87(12.40\% – 5.30\%)$
$R_S = 18.58\%$

South Pole:

$R_S = R_F + \beta_{Equity}(R_M – R_F)$
$R_S = 5.30\% + 2.31(12.40\% – 5.30\%)$
$R_S = 21.73\%$

6. *a.* If flotation costs are not taken into account, the net present value of a loan equals:

NPV_{Loan} = Gross Proceeds – Aftertax present value of interest and principal payments
$NPV_{Loan} = \$5,350,000 – .08(\$5,350,000)(1 – .40)PVIFA_{8\%,10} – \$5,350,000/1.08^{10}$
$NPV_{Loan} = \$1,148,765.94$

b. The flotation costs of the loan will be:

Flotation costs = $5,350,000(.0125)
Flotation costs = $66,875

So, the annual flotation expense will be:

Annual flotation expense = $66,875 / 10
Annual flotation expense = $6,687.50

If flotation costs are taken into account, the net present value of a loan equals:

NPV_{Loan} = Proceeds net of flotation costs – Aftertax present value of interest and principal payments + Present value of the flotation cost tax shield
$NPV_{Loan} = (\$5{,}350{,}000 – 66{,}875) – .08(\$5{,}350{,}000)(1 – .40)(PVIFA_{8\%,10}) – \$5{,}350{,}000/1.08^{10} + \$6{,}687.50(.40)(PVIFA_{8\%,10})$
$NPV_{Loan} = \$1{,}099{,}840.40$

7. First we need to find the aftertax value of the revenues minus expenses. The aftertax value is:

Aftertax revenue = \$3,800,000(1 – .40)
Aftertax revenue = \$2,280,000

Next, we need to find the depreciation tax shield. The depreciation tax shield each year is:

Depreciation tax shield = Depreciation(t_C)
Depreciation tax shield = (\$11,400,000 / 6)(.40)
Depreciation tax shield = \$760,000

Now we can find the NPV of the project, which is:

NPV = Initial cost + PV of depreciation tax shield + PV of aftertax revenue

To find the present value of the depreciation tax shield, we should discount at the risk-free rate, and we need to discount the aftertax revenues at the cost of equity, so:

$NPV = –\$11{,}400{,}000 + \$760{,}000(PVIFA_{6\%,6}) + \$2{,}280{,}000(PVIFA_{14\%,6})$
NPV = \$1,203,328.43

8. Whether the company issues stock or issues equity to finance the project is irrelevant. The company's optimal capital structure determines the WACC. In a world with corporate taxes, a firm's weighted average cost of capital equals:

$R_{WACC} = [B / (B + S)](1 – t_C)R_B + [S / (B + S)]R_S$
$R_{WACC} = .80(1 – .34)(.072) + .20(.1140)$
R_{WACC} = .0608 or 6.08%

Now we can use the weighted average cost of capital to discount NEC's unlevered cash flows. Doing so, we find the NPV of the project is:

NPV = –\$40,000,000 + \$2,600,000 / 0.0608
NPV = \$2,751,907.39

9. *a.* The company has a capital structure with three parts: long-term debt, short-term debt, and equity. Since interest payments on both long-term and short-term debt are tax-deductible, multiply the pretax costs by (1 – t_C) to determine the aftertax costs to be used in the weighted average cost of capital calculation. The WACC using the book value weights is:

$R_{WACC} = (w_{STD})(R_{STD})(1 – t_C) + (w_{LTD})(R_{LTD})(1 – t_C) + (w_{Equity})(R_{Equity})$
$R_{WACC} = (\$3 / \$19)(.035)(1 – .35) + (\$10 / \$19)(.068)(1 – .35) + (\$6 / \$19)(.145)$
R_{WACC} = 0.0726 or 7.26%

b. Using the market value weights, the company's WACC is:

$R_{WACC} = (w_{STD})(R_{STD})(1 – t_C) + (w_{LTD})(R_{LTD})(1 – t_C) + (w_{Equity})(R_{Equity})$
$R_{WACC} = (\$3 / \$40)(.035)(1 – .35) + (\$11 / \$40)(.068)(1 – .35) + (\$26 / \$40)(.145)$
$R_{WACC} = 0.1081$ or 10.81%

c. Using the target debt-equity ratio, the target debt-value ratio for the company is:

B/S = 0.60
B = 0.6S

Substituting this in the debt-value ratio, we get:

B/V = .6S / (.6S + S)
B/V = .6 / 1.6
B/V = .375

And the equity-value ratio is one minus the debt-value ratio, or:

S/V = 1 – .375
S/V = .625

We can use the ratio of short-term debt to long-term debt in a similar manner to find the short-term debt to total debt and long-term debt to total debt. Using the short-term debt to long-term debt ratio, we get:

STD/LTD = 0.20
STD = 0.2LTD

Substituting this in the short-term debt to total debt ratio, we get:

STD/B = .2LTD / (.2LTD + LTD)
STD/B = .2 / 1.2
STD/B = .167

And the long-term debt to total debt ratio is one minus the short-term debt to total debt ratio, or:

LTD/B = 1 – .167
LTD/B = .833

Now we can find the short-term debt to value ratio and long-term debt to value ratio by multiplying the respective ratio by the debt-value ratio. So:

STD/V = (STD/B)(B/V)
STD/V = .167(.375)
STD/V = .063

And the long-term debt to value ratio is:

LTD/V = (LTD/B)(B/V)
LTD/V = .833(.375)
LTD/V = .313

So, using the target capital structure weights, the company's WACC is:

$R_{WACC} = (w_{STD})(R_{STD})(1 - t_C) + (w_{LTD})(R_{LTD})(1 - t_C) + (w_{Equity})(R_{Equity})$
$R_{WACC} = (.06)(.035)(1 - .35) + (.31)(.068)(1 - .35) + (.625)(.145)$
$R_{WACC} = 0.1059$ or 10.59%

d. The differences in the WACCs are due to the different weighting schemes. The company's WACC will most closely resemble the WACC calculated using target weights since future projects will be financed at the target ratio. Therefore, the WACC computed with target weights should be used for project evaluation.

Intermediate

10. The adjusted present value of a project equals the net present value of the project under all-equity financing plus the net present value of any financing side effects. In the joint venture's case, the NPV of financing side effects equals the aftertax present value of cash flows resulting from the firms' debt. So, the APV is:

APV = NPV(All-Equity) + NPV(Financing Side Effects)

The NPV for an all-equity firm is:

NPV(All-Equity)

NPV = –Initial Investment + PV[$(1 - t_C)$(EBITD)] + PV(Depreciation Tax Shield)

Since the initial investment will be fully depreciated over five years using the straight-line method, annual depreciation expense is:

Annual depreciation = \$30,000,000/5
Annual depreciation = \$6,000,000

NPV = –\$30,000,000 + (1 – 0.35)(\$3,800,000)$PVIFA_{5.13\%,20}$ + (0.35)(\$6,000,000)$PVIFA_{5,13\%,20}$
NPV = –\$5,262,677.95

NPV(Financing Side Effects)

The NPV of financing side effects equals the after-tax present value of cash flows resulting from the firm's debt. The coupon rate on the debt is relevant to determine the interest payments, but the resulting cash flows should still be discounted at the pretax cost of debt. So, the NPV of the financing effects is:

NPV = Proceeds – Aftertax PV(Interest Payments) – PV(Principal Repayments)
NPV = \$18,000,000 – (1 – 0.35)(0.05)(\$18,000,000)$PVIFA_{8.5\%,15}$ – \$18,000,000/1.085^{15}
NPV = \$7,847,503.56

So, the APV of the project is:

APV = NPV(All-Equity) + NPV(Financing Side Effects)
APV = –$5,262,677.95 + $7,847,503.56
APV = $2,584,825.61

11. If the company had to issue debt under the terms it would normally receive, the interest rate on the debt would increase to the company's normal cost of debt. The NPV of an all-equity project would remain unchanged, but the NPV of the financing side effects would change. The NPV of the financing side effects would be:

NPV = Proceeds – Aftertax PV(Interest Payments) – PV(Principal Repayments)
NPV = $18,000,000 – (1 – 0.35)(0.085)($18,000,000)$PVIFA_{8.5\%,15}$ – $18,000,000/$((1.085)^{15}$
NPV = $4,446,918.69

Using the NPV of an all-equity project from the previous problem, the new APV of the project would be:

APV = NPV(All-Equity) + NPV(Financing Side Effects)
APV = –$5,262,677.95 + $4,446,918.69
APV = –$815,759.27

The gain to the company from issuing subsidized debt is the difference between the two APVs, so:

Gain from subsidized debt = $2,584,825.61 – (–815,759.27)
Gain from subsidized debt = $3,400,584.88

Most of the value of the project is in the form of the subsidized interest rate on the debt issue.

12. The adjusted present value of a project equals the net present value of the project under all-equity financing plus the net present value of any financing side effects. First, we need to calculate the unlevered cost of equity. According to Modigliani-Miller Proposition II with corporate taxes:

$R_S = R_0 + (B/S)(R_0 - R_B)(1 - t_C)$
$.16 = R_0 + (0.50)(R_0 - 0.09)(1 - 0.40)$
$R_0 = 0.1438$ or 14.38%

Now we can find the NPV of an all-equity project, which is:

NPV = PV(Unlevered Cash Flows)
NPV = –$21,000,000 + $6,900,000/1.1438 + $11,000,000/$(1.1438)^2$ + $9,500,000/$(1.1438)^3$
NPV = –$212,638.89

Next, we need to find the net present value of financing side effects. This is equal the aftertax present value of cash flows resulting from the firm's debt. So:

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

Each year, an equal principal payment will be made, which will reduce the interest accrued during the year. Given a known level of debt, debt cash flows should be discounted at the pre-tax cost of debt, so the NPV of the financing effects are:

$$NPV = \$7,000,000 - (1 - .40)(.09)(\$7,000,000) / (1.09) - \$2,333,333.33/(1.09)$$
$$- (1 - .40)(.09)(\$4,666,666.67)/(1.09)^2 - \$2,333,333.33/(1.09)^2$$
$$- (1 - .40)(.09)(\$2,333,333.33)/(1.09)^3 - \$2,333,333.33/(1.09)^3$$
$$NPV = \$437,458.31$$

So, the APV of project is:

$$APV = NPV(\text{All-equity}) + NPV(\text{Financing side effects})$$
$$APV = -\$212,638.89 + 437,458.31$$
$$APV = \$224,819.42$$

13. *a.* To calculate the NPV of the project, we first need to find the company's WACC. In a world with corporate taxes, a firm's weighted average cost of capital equals:

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

The market value of the company's equity is:

Market value of equity = 6,000,000($20)
Market value of equity = $120,000,000

So, the debt-value ratio and equity-value ratio are:

Debt-value = $35,000,000 / ($35,000,000 + 120,000,000)
Debt-value = .2258

Equity-value = $120,000,000 / ($35,000,000 + 120,000,000)
Equity-value = .7742

Since the CEO believes its current capital structure is optimal, these values can be used as the target weights in the firm's weighted average cost of capital calculation. The yield to maturity of the company's debt is its pretax cost of debt. To find the company's cost of equity, we need to calculate the stock beta. The stock beta can be calculated as:

$$\beta = \sigma_{S,M} / \sigma^2_M$$
$$\beta = .036 / .20^2$$
$$\beta = 0.90$$

Now we can use the Capital Asset Pricing Model to determine the cost of equity. The Capital Asset Pricing Model is:

$$R_S = R_F + \beta(R_M - R_F)$$
$$R_S = 6\% + 0.90(7.50\%)$$
$$R_S = 12.75\%$$

Now, we can calculate the company's WACC, which is:

$R_{WACC} = [B / (B + S)](1 – t_C)R_B + [S / (B + S)]R_S$
$R_{WACC} = .2258(1 – .35)(.08) + .7742(.1275)$
$R_{WACC} = .1105$ or 11.05%

Finally, we can use the WACC to discount the unlevered cash flows, which gives us an NPV of:

NPV = –\$45,000,000 + \$13,500,000($PVIFA_{11.05\%,5}$)
NPV = \$4,837,978.59

b. The weighted average cost of capital used in part *a* will not change if the firm chooses to fund the project entirely with debt. The weighted average cost of capital is based on optimal capital structure weights. Since the current capital structure is optimal, all-debt funding for the project simply implies that the firm will have to use more equity in the future to bring the capital structure back towards the target.

Challenge

14. *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 = [(\$28,000,000)(1 – .35)] / .20
V_U = \$91,000,000

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

Price per share = \$91,000,000 / 1,500,000
Price per share = \$60.67

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 = Proceeds – Aftertax PV(Interest Payments)
NPV = \$35,000,000 – (1 – .35)(.09)(\$35,000,000) / .09
NPV = \$12,250,000

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

V = \$91,000,000 + 12,250,000
V = \$103,250,000

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 = \$103,250,000 / 1,500,000
New share price = \$68.83

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 = \$35,000,000 / \$68.83
Shares repurchased = 508,475

And the new number of shares outstanding will be:

New shares outstanding = 1,500,000 – 508,475
New shares outstanding = 991,525

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 = \$103,250,000 – 35,000,000
New value of equity = \$68,250,000

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

New share price = \$68,250,000 / 991,525
New share price = \$68.83

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:

$R_S = R_0 + (B/S)(R_0 – R_B)(1 – t_C)$
$R_S = .20 + (\$35,000,000 / \$68,250,000)(.20 – .09)(1 – .35)$
$R_S = .2367$ or 23.67%

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

EBIT	\$28,000,000
Interest	3,150,000
EBT	\$24,850,000
Taxes	8,697,500
Net income	\$16,152,500

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
$S = \$16,152,500 / .2367$
$S = \$68,250,000$

15. *a.* If the company were financed entirely by equity, the value of the firm would be equal to the present value of its unlevered after-tax earnings, discounted at its unlevered cost of capital. First, we need to find the company's unlevered cash flows, which are:

Sales	$28,900,000
Variable costs	17,340,000
EBT	$11,560,000
Tax	4,624,000
Net income	$6,936,000

So, the value of the unlevered company is:

$V_U = \$6,936,000 / .17$
$V_U = \$40,800,000$

b. According to Modigliani-Miller Proposition II with corporate taxes, the value of levered equity is:

$R_S = R_0 + (B/S)(R_0 – R_B)(1 – t_C)$
$R_S = .17 + (.35)(.17 – .09)(1 – .40)$
$R_S = .1868$ or 18.68%

c. In a world with corporate taxes, a firm's weighted average cost of capital equals:

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

So we need the debt-value and equity-value ratios for the company. The debt-equity ratio for the company is:

$B/S = 0.35$
$B = 0.35S$

Substituting this in the debt-value ratio, we get:

$B/V = .35S / (.35S + S)$
$B/V = .35 / 1.35$
$B/V = .26$

And the equity-value ratio is one minus the debt-value ratio, or:

$S/V = 1 - .26$
$S/V = .74$

So, using the capital structure weights, the company's WACC is:

$R_{WACC} = [B / (B + S)](1 - t_C)R_B + [S / (B + S)]R_S$
$R_{WACC} = .26(1 - .40)(.09) + .74(.1868)$
$R_{WACC} = .1524$ or 15.24%

We can use the weighted average cost of capital to discount the firm's unlevered aftertax earnings to value the company. Doing so, we find:

$V_L = \$6,936,000 / .1524$
$V_L = \$45,520,661.16$

Now we can use the debt-value ratio and equity-value ratio to find the value of debt and equity, which are:

$B = V_L$(Debt-value)
$B = \$45,520,661.16(.26)$
$B = \$11,801,652.89$

$S = V_L$(Equity-value)
$S = \$45,520,661.16(.74)$
$S = \$33,719,008.26$

d. In order to value a firm's equity using the flow-to-equity approach, we can discount the cash flows available to equity holders at the cost of the firm's levered equity. First, we need to calculate the levered cash flows available to shareholders, which are:

Sales	$28,900,000
Variable costs	17,340,000
EBIT	$11,560,000
Interest	1,062,149
EBT	$10,497,851
Tax	4,199,140
Net income	$6,298,711

So, the value of equity with the flow-to-equity method is:

S = Cash flows available to equity holders / R_S
$S = \$6,298,711 / .1868$
$S = \$33,719,008.26$

16. *a.* Since the company is currently an all-equity firm, its value equals the present value of its unlevered after-tax earnings, discounted at its unlevered cost of capital. The cash flows to shareholders for the unlevered firm are:

EBIT	$83,000
Tax	33,200
Net income	$49,800

So, the value of the company is:

V_U = $49,800 / .15
V_U = $332,000

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 after-tax present value of cash flows resulting from debt. Given a known level of debt, debt cash flows should be discounted at the pre-tax cost of debt, so:

NPV = Proceeds – Aftertax PV(Interest payments)
NPV = $195,000 – (1 – .40)(.09)($195,000) / 0.09
NPV = $78,000

So, using the APV method, the value of the company is:

APV = V_U + NPV(Financing side effects)
APV = $332,000 + 78,000
APV = $410,000

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

S = V – B
S = $410,000 – 195,000
S = $215,000

c. 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 = .15 + ($195,000 / $215,000)(.15 – .09)(1 – .40)
R_S = .1827 or 18.27%

d. In order to value a firm's equity using the flow-to-equity approach, we can discount the cash flows available to equity holders at the cost of the firm's levered equity. First, we need to calculate the levered cash flows available to shareholders, which are:

EBIT	$83,000
Interest	17,550
EBT	$65,450
Tax	26,180
Net income	$39,270

So, the value of equity with the flow-to-equity method is:

S = Cash flows available to equity holders / R_S
S = $39,270 / .1827
S = $215,000

17. Since the company is not publicly traded, we need to use the industry numbers to calculate the industry levered return on equity. We can then find the industry unlevered return on equity, and re-lever the industry return on equity to account for the different use of leverage. So, using the CAPM to calculate the industry levered return on equity, we find:

$R_S = R_F + \beta(MRP)$
$R_S = 5\% + 1.2(7\%)$
$R_S = 13.40\%$

Next, to find the average cost of unlevered equity in the holiday gift industry we can use Modigliani-Miller Proposition II with corporate taxes, so:

$R_S = R_0 + (B/S)(R_0 - R_B)(1 - t_C)$
$.1340 = R_0 + (.35)(R_0 - .05)(1 - .40)$
$R_0 = .1194$ or 11.94%

Now, we can use the Modigliani-Miller Proposition II with corporate taxes to re-lever the return on equity to account for this company's debt-equity ratio. Doing so, we find:

$R_S = R_0 + (B/S)(R_0 - R_B)(1 - t_C)$
$R_S = .1194 + (.40)(.1194 - .05)(1 - .40)$
$R_S = .1361$ or 13.61%

Since the project is financed at the firm's target debt-equity ratio, it must be discounted at the company's weighted average cost of capital. In a world with corporate taxes, a firm's weighted average cost of capital equals:

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

So, we need the debt-value and equity-value ratios for the company. The debt-equity ratio for the company is:

$B/S = 0.40$
$B = 0.40S$

Substituting this in the debt-value ratio, we get:

$B/V = .40S / (.40S + S)$
$B/V = .40 / 1.40$
$B/V = .29$

And the equity-value ratio is one minus the debt-value ratio, or:

$S/V = 1 – .29$
$S/V = .71$

So, using the capital structure weights, the company's WACC is:

$R_{WACC} = [B / (B + S)](1 – t_C)R_B + [S / (B + S)]R_S$
$R_{WACC} = .29(1 – .40)(.05) + .71(.1361)$
$R_{WACC} = .1058$ or 10.58%

Now we need the project's cash flows. The cash flows increase for the first five years before leveling off into perpetuity. So, the cash flows from the project for the next six years are:

Year 1 cash flow	$80,000.00
Year 2 cash flow	$84,000.00
Year 3 cash flow	$88,200.00
Year 4 cash flow	$92,610.00
Year 5 cash flow	$97,240.50
Year 6 cash flow	$97,240.50

So, the NPV of the project is:

$$NPV = –\$475,000 + \$80,000/1.1058 + \$84,000/1.1058^2 + \$88,200/1.1058^3 + \$92,610/1.1058^4 + \$97,240.50/1.1058^5 + (\$97,240.50/.1058)/1.1058^5$$
$NPV = \$408,125.67$