PART 4

Long-Term Financial Decisions

CHAPTERS IN THIS PART

INTEGRATIVE CASE 4
O'GRADY APPAREL COMPANY

CHAPTER 11

The Cost of Capital

INSTRUCTOR'S RESOURCES

Overview

This chapter introduces the student to an important financial concept, the cost of capital. The mechanics of computing the sources of capital-debt, preferred stock, common stock, and retained earnings are reviewed. The relationship between the cost of capital and both the firm's financing activities and capital investment decisions is explored. In the framework of a target capital structure, the weighted average cost of capital is then applied to capital investment decisions.

PMF DISK

PMF Tutor: Cost of Capital

Topics from this chapter covered in the *PMF Tutor* are after-tax cost of debt; cost of preferred stock; cost of common stock, CAPM; cost of common stock, constant growth; cost of new common stock; and weighted average cost of capital.

PMF Problem- Solver: Cost of Capital

This module allows the student to determine the following: 1) cost of long-term debt (bonds), 2) cost of preferred stock, 3) cost of common stock, 4) weighted average cost of capital, and 5) weighted marginal cost of capital.

PMF Templates

Spreadsheet templates are provided for the following problems:

Problem	Topic
11-6	Cost of preferred stock
11-7	Cost of common stock equity–CAPM

Study Guide

Suggested *Study Guide* examples for classroom presentation:

Example	Topic
7	Weighted average cost of capital
8	Marginal cost of capital schedule

ANSWERS TO REVIEW QUESTIONS

11-1 The *cost of capital* is the rate of return a firm must earn on its investment in order to maintain the market value of its stock. The cost of capital provides a benchmark against which the potential rate of return on an investment is compared..

11-2 Holding business risk constant assumes that the acceptance of a given project leaves the firm's ability to meet its operating expenses unchanged. Holding financial risk constant assumes that the acceptance of a given project leaves the firm's ability to meet its required financing expenses unchanged. By doing this it is possible to more easily calculate the firm's cost of capital, which is a factor taken into consideration in evaluating new projects.

11-3 The *cost of capital* is measured on an after-tax basis in order to be consistent with the capital budgeting framework. The only component of the cost of capital that actually requires a tax adjustment is the cost of debt, since interest on debt is treated as a tax-deductible expenditure. Measuring the cost of debt on an after-tax basis reduces the cost.

The use of the weighted average cost of capital is recommended over the cost of the source of funds to be used for the project. The interrelatedness of financing decisions assuming the presence of a target capital structure is reflected in the weighted average cost of capital.

11-4 In order to make any such financing decision, the *overall cost of capital* must be considered. This results from the interrelatedness of financing activities. For example, a firm raising funds with debt today may need to use equity the next time, and the cost of equity will be related to the overall capital structure, including debt, of the firm at the time.

11-5 The *net proceeds* from the sale of a bond are the funds received from its sale after all underwriting and brokerage fees have been paid. A bond sells at a discount when the rate of interest currently paid on similar-risk bonds is above the bond's coupon rate. Bonds sell at a premium when their coupon rate is above the prevailing market rate of interest on similar-risk bonds.

Flotation costs are fees charged by investment banking firms for their services in assisting in selling the bonds in the primary market. These costs reduce the total proceeds received by the firm since the fees are paid from the bond funds.

11-6 The three approaches to finding the before-tax cost of debt are:

1. The *quotation approach* which uses the current market value of a bond to determine the yield-to-maturity on the bond. If the market price of the bond is equal to its par value the yield-to-maturity is the same as the coupon rate.
2. The *calculation approach* finds the before-tax cost of debt by calculating the internal rate of return (IRR) on the bond cash flows.
3. The *approximation approach* uses the following formula to approximate the before-tax cost of the debt.

$$k_d = \frac{I + \frac{[(\$1{,}000 - N_d)]}{n}}{\frac{(N_d + \$1{,}000)}{2}}$$

Where: I = the annual interest payment in dollars
N_d = the net proceeds from the sale of a bond
n = the term of the bond in years

The first part of the numerator of the equation represents the annual interest, and the second part represents the amortization of any discount or premium; the denominator represents the average amount borrowed.

11-7 The before-tax cost is converted to an after-tax debt cost (k_i) by using the following equation: $k_i = k_d \times (1 - T)$, where T is the firm's tax rate.

11-8 The cost of preferred stock is found by dividing the annual preferred stock dividend by the net proceeds from the sale of the preferred stock. The formula is:

$$k_p = \frac{D_p}{N_p}$$

Where: D_p = the annual dividend payment in dollars
N_p = the net proceeds from the sale of the preferred stock

11-9 The assumptions underlying the constant growth valuation (Gordon) model are:

1. The value of a share of stock is the present value of all dividends expected to be paid over its life.
2. The rate of growth of dividends and earnings is constant, which means that the firm has a *fixed payout ratio*.
3. Firms perceived by investors to be equally risky have their expected earnings discounted at the same rate.

11-10 The cost of retained earnings is technically less than the cost of new common stock, since by using retained earnings (cash) the firm avoids underwriting costs, as well as possible underpricing costs.

11-11 The *weighted average cost of capital (WACC)*, k_a, is an average of the firm's cost of long-term financing. It is calculated by weighting the cost of each specific type of capital by its proportion in the firm's capital structure

11-12 Using *target capital structure weights*, the firm is trying to develop a capital structure which is optimal for the future, given present investor attitudes toward financial risk. Target capital structure weights are most often based on desired changes in historical book value weights. Unless significant changes are implied by the target capital structure weights, little difference in the weighted marginal cost of capital results from their use.

11-13 The *weighted marginal cost of capital (WMCC)* is the firm's weighted average cost of capital associated with its next dollar of total new financing. The WMCC is of interest to managers because it represents the current cost of funds should the firm need to go to the capital markets for new financing. The schedule of WMCC increases as a firm goes to the market for larger sums of money because the risk exposure to the supplier of funds of the borrowing firm's risk increases to the point that the lender must increase their interest rate to justify the additional risk.

11-14 The *investment opportunities schedule (IOS)* is a ranking of the firm's investment opportunities from the best (highest returns) to worst (lowest returns). The schedule is structured so that it is a decreasing

function of the level of total investment. The downward direction of the schedule is due to the benefit of selecting the projects with the greatest return. The look also helps in the identification of the projects that have an IRR in excess of the cost of capital, and in see which projects can be accepted before the firm exceeds it limited capital budget.

11-15 All projects to the left of the cross-over point of the IOS and the WMCC lines have an IRR greater than the firm's cost of capital. Undertaking all of these projects will maximize the owner's wealth. Selecting any projects to the right of the cross-over point will decrease the owner's wealth. In practice manager's normally do not invest to the point where IOS = WMCC due to the self-imposed capital budgeting constraint most firm's follow.

SOLUTIONS TO PROBLEMS

11-1 LG 1: Concept of Cost of Capital

a. The firm is basing its decision on the cost to finance a particular project rather than the firm's combined cost of capital. This decision-making method may lead to erroneous accept/reject decisions.

b. $k_a = w_d k_d + w_e k_e$
$k_a = .40\ (7\%) + .60(16\%)$
$k_a = 2.8\% + 9.6\%$
$k_a = 12.4\%$

c. Reject project 263. Accept project 264.

d. Opposite conclusions were drawn using the two decision criteria. The overall cost of capital as a criterion provides better decisions because it takes into consideration the long-run interrelationship of financing decisions.

11-2 LG 2: Cost of Debt Using Both Methods

a. Net Proceeds: $N_d = \$1{,}010 - \$30$
$N_d = \$980$

b. Cash Flows:

t	CF
0	$ 980
1-15	-120
15	-1,000

c. Cost to Maturity:

$$B_o = \left[\sum_{t=1}^{n} \frac{I}{(1+k)^t}\right] + \left[\frac{M}{(1+k)^n}\right]$$

$$\$980 = \left[\sum_{t=1}^{15} \frac{-\$120}{(1+k)^t}\right] + \left[\frac{-\$1{,}000}{(1+k)^{15}}\right]$$

Step 1: Try 12%
$V = 120 \times (6.811) + 1{,}000 \times (.183)$
$V = 817.32 + 183$
$V = \$1{,}000.32$

(Due to rounding of the PVIF, the value of the bond is 32 cents greater than expected. At the coupon rate, the value of a $ 1,000 face value bond is $1,000.)

Try 13%:
$V = 120 \times (6.462) + 1{,}000 \times (.160)$
$V = 775.44 + 160$
$V = \$935.44$
The cost to maturity is between 12% and 13%.

Step 2: $1,000.32 - $935.44 = $64.88

Step 3: $1,000.32 - $980.00 = $20.32

Step 4: $20.32 ÷ $64.88 = .31

Step 5: 12 + .31 = 12.31% = before-tax cost of debt
12.31 (1 - .40) = 7.39% = after-tax cost of debt

Calculator solution: 12.30%

d. Approximate before-tax cost of debt

$$k_d = \frac{I + \frac{\$1{,}000 - N_d}{n}}{\frac{N_d + \$1{,}000}{2}}$$

$$k_d = \frac{\$120 + \frac{(\$1{,}000 - \$980)}{15}}{\frac{(\$980 + \$1{,}000)}{2}}$$

k_d = $121.33 ÷ $990.00
k_d = 12.26%

Approximate after-tax cost of debt = 12.26% x (1 - .4) = 7.36%

e. The interpolated cost of debt is closer to the actual cost (12.2983%) than using the approximating equation. However, the short cut approximation is fairly accurate and expedient.

11-3 LG 2: Cost of Debt–Using the Approximation Formula:

$$k_d = \frac{I + \frac{\$1{,}000 - N_d}{n}}{\frac{N_d + \$1{,}000}{2}} \qquad k_i = k_d \text{ x } (1 - T)$$

Bond A

$$k_d = \frac{\$90 + \frac{\$1{,}000 - \$955}{20}}{\frac{\$955 + \$1{,}000}{2}} = \frac{\$92.25}{\$977.50} = 9.44\%$$

k_i = 9.44% x (1 - .40) = 5.66%

Bond B

$$k_d = \frac{\$100 + \frac{\$1{,}000 - \$970}{16}}{\frac{\$970 + \$1{,}000}{2}} = \frac{\$101.88}{\$985} = 10.34\%$$

k_i = 10.34% x (1 - .40) = 6.20%

Bond C

$$k_d = \frac{\$120 + \frac{\$1{,}000 - \$955}{15}}{\frac{\$955 + \$1{,}000}{2}} = \frac{\$123}{\$977.50} = 12.58\%$$

k_i = 12.58% x (1 - .40) = 7.55%

Bond D

$$k_d = \frac{\$90 + \frac{\$1{,}000 - \$985}{25}}{\frac{\$985 + \$1{,}000}{2}} = \frac{\$90.60}{\$992.50} = 9.13\%$$

k_i = 9.13% x (1 - .40) = 5.48%

Bond E

$$k_d = \frac{\$110 + \frac{\$1{,}000 - \$920}{22}}{\frac{\$920 + \$1{,}000}{2}} = \frac{\$113.64}{\$960} = 11.84\%$$

k_i = 11.84% x (1 - .40) = 7.10%

11-4 LG 2: The Cost of Debt Using the Approximation Formula

$$k_d = \frac{I + \frac{\$1{,}000 - N_d}{n}}{\frac{N_d + \$1{,}000}{2}} \qquad k_i = k_d \times (1 - T)$$

Alternative A

$$k_d = \frac{\$90 + \frac{\$1{,}000 - \$1{,}220}{16}}{\frac{\$1{,}220 + \$1{,}000}{2}} = \frac{\$76.25}{\$1{,}110} = 6.87\%$$

k_i = 6.87% x (1 - .40) = 4.12%

Alternative B

$$k_d = \frac{\$70 + \frac{\$1{,}000 - \$1{,}020}{5}}{\frac{\$1{,}020 + \$1{,}000}{2}} = \frac{\$66.00}{\$1{,}010} = 6.54\%$$

$k_i = 6.54\% \times (1 - .40) = 3.92\%$

Alternative C

$$k_d = \frac{\$60 + \frac{\$1{,}000 - \$970}{7}}{\frac{\$970 + \$1{,}000}{2}} = \frac{\$64.29}{\$985} = 6.53\%$$

$k_i = 6.53\% \times (1 - .40) = 3.92\%$

Alternative D

$$k_d = \frac{\$50 + \frac{\$1{,}000 - \$895}{10}}{\frac{\$895 + \$1{,}000}{2}} = \frac{\$60.50}{\$947.50} = 6.39\%$$

$k_i = 6.39\% \times (1 - .40) = 3.83\%$

11-5 LG 2: Cost of Preferred Stock: $k_p = D_p \div N_p$

a. $$k_p = \frac{\$12.00}{\$95.00} = 12.63\%$$

b. $$k_p = \frac{\$10.00}{\$90.00} = 11.11\%$$

11-6 LG 2: Cost of Preferred Stock: $k_p = D_p \div N_p$

Preferred Stock	Calculation						
A	k_p	=	\$11.00	÷	\$92.00	=	11.96%
B	k_p	=	3.20	÷	34.50	=	9.28%
C	k_p	=	5.00	÷	33.00	=	15.15%
D	k_p	=	3.00	÷	24.50	=	12.24%
E	k_p	=	1.80	÷	17.50	=	10.29%

11-7 LG 3: Cost of Common Stock Equity–CAPM

$k_s = R_F + [b \times (k_m - R_F)]$
$k_s = 6\% + 1.2 \times (11\% - 6\%)$
$k_s = 6\% + 6\%$
$k_s = 12\%$

a. Risk premium = 6%

b. Rate of return = 12%

c. After-tax cost of common equity using the CAPM = 12%

11-8 LG 3: Cost of Common Stock Equity: $k_n = \frac{D_1 + g}{N_n}$

a. $$g = \frac{D_{2003}}{D_{1999}} = FVIF_{k\%,4}$$

$$g = \frac{\$3.10}{\$2.12} = 1.462$$

From FVIF table, the factor closest to 1.462 occurs at 10% (i.e., 1.464 for 4 years). Calculator solution: 9.97%

b. N_n = \$52 (given in the problem)

c.

$$k_r = \frac{D_{2004}}{P_0} + g$$

$$k_r = \frac{\$3.40}{\$57.50} + .10 = 15.91\%$$

d.

$$k_r = \frac{D_{2004}}{N_n} + g$$

$$k_r = \frac{\$3.40}{\$55.00} + .10 = 16.54\%$$

11-9 LG 3: Retained Earnings versus New Common Stock

$$k_r = \frac{D_1}{P_0} + g \qquad k_n = \frac{D_1}{N_n} + g$$

Firm	Calculation						
A	k_r	=	(\$2.25 ÷ \$50.00)	+	8%	=	12.50%
	k_n	=	(\$2.25 ÷ \$47.00)	+	8%	=	12.79%
B	k_r	=	(\$1.00 ÷ \$20.00)	+	4%	=	9.00%
	k_n	=	(\$1.00 ÷ \$18.00)	+	4%	=	9.56%
C	k_r	=	(\$2.00 ÷ \$42.50)	+	6%	=	10.71%
	k_n	=	(\$2.00 ÷ \$39.50)	+	6%	=	11.06%
D	k_r	=	(\$2.10 ÷ \$19.00)	+	2%	=	13.05%
	k_n	=	(\$2.10 ÷ \$16.00)	+	2%	=	15.13%

11-10 LG 2, 4: The Effect of Tax Rate on WACC

a. WACC = (.30)(11%)(1 – .40) + (.10)(9%) + (.60)(14%)
WACC = 1.98% + .9% + 8.4%
WACC = 11.28%

b. WACC = (.30)(11%)(1 – .35) + (.10)(9%) + (.60)(14%)

WACC = 2.15% + .9% + 8.4%
WACC = 11.45%

c. WACC = (.30)(11%)(1 – .25) + (.10)(9%) + (.60)(14%)
WACC = 2.48% + .9% + 8.4%
WACC = 11.78%

d. As the tax rate decreases, the WACC increases due to the reduced tax shield from the tax-deductible interest on debt.

11-11 LG 4: WACC–Book Weights

a.

Type of Capital	Book Value	Weight	Cost	Weighted Cost
L-T Debt	$ 700,000	0.500	5.3%	2.650%
Preferred stock	50,000	0.036	12.0%	.432%
Common stock	650,000	0.464	16.0%	7.424%
	$1,400,000	1.000		10.506%

b. The WACC is the rate of return that the firm must receive on long-term projects to maintain the value of the firm. The cost of capital can be compared to the return for a project to determine whether the project is acceptable.

11-12 LG 4: WACC–Book Weights and Market Weights

a. Book value weights:

Type of Capital	Book Value	Weight	Cost	Weighted Cost
L-T Debt	$4,000,000	0.784	6.00%	4.704%
Preferred stock	40,000	0.008	13.00%	.104%
Common stock	1,060,000	0.208	17.00%	3.536%
	$5,100,000			8.344%

b. Market value weights:

Type of Capital	Market Value	Weight	Cost	Weighted Cost
L-T Debt	$3,840,000	0.557	6.00%	3.342%
Preferred stock	60,000	0.009	13.00	.117%
Common stock	3,000,000	0.435	17.00	7.395%
	$6,900,000			10.854%

c. The difference lies in the two different value bases. The market value approach yields the better value since the costs of the components of the capital structure are calculated using the prevailing market prices. Since the common stock is selling at a higher value than its book value, the cost of capital is much higher when using the market value weights. Notice that the book value weights give the firm a much greater leverage position than when the market value weights are used.

11-13 LG 4: WACC and Target Weights

a. Historical market weights:

Type of Capital	Weight	Cost	Weighted Cost
L-T Debt	.25	7.20%	1.80%
Preferred stock	.10	13.50%	1.35%
Common stock	.65	16.00%	10.40%
			13.55%

b. Target market weights:

Type of Capital	Weight	Cost	Weighted Cost
L-T Debt	.30	7.20%	2.160%
Preferred Stock	.15	13.50%	2.025%
Common Stock	.55	16.00%	8.800%
			12.985%

11-14 LG 2, 3, 4, 5: Cost of Capital and Break Point

a. Cost of Retained Earnings

$$k_r = \frac{\$1.26(1+.06)}{\$40.00} + .06 = \frac{\$1.34}{\$40.00} = 3.35\% + 6\% = 9.35\%$$

b. Cost of New Common Stock

$$k_s = \frac{\$1.26(1+.06)}{\$40.00 - \$1.00} + .06 = \frac{\$1.34}{\$39.00} = 3.44\% + 6\% = 9.44\%$$

c. Cost of Preferred Stock

$$k_p = \frac{\$2.00}{\$25.00 - \$3.00} = \frac{\$2.00}{\$22.00} = 9.09\%$$

d.

$$k_d = \frac{\$100 + \frac{\$1{,}000 - \$1{,}175}{5}}{\frac{\$1{,}175 + \$1{,}000}{2}} = \frac{\$65.00}{\$1{,}087.50} = 5.98\%$$

k_i = 5.98% x (1 - .40) = 3.59%

e.

$$BP_{\text{common equity}} = \frac{\$4{,}200{,}000 - (\$1.26 \times 1{,}000{,}000)}{.50} = \frac{\$2{,}940{,}000}{.50} = \$5{,}880{,}000$$

f. WACC = (.40)(3.59%) + (.10)(9.09%) + (.50)(9.35%)
WACC = 1.436 + .909 + 4.675
WACC = 7.02%

This WACC applies to projects with a cumulative cost between 0 and $5,880,000.

g. WACC = (.40)(3.59%) + (.10)(9.09%) + (.50)(9.44%)
WACC = 1.436 + .909 + 4.72
WACC = 7.07%

This WACC applies to projects with a cumulative cost over $5,880,000.

11-15 LG 2, 3, 4, 5: Calculation of Specific Costs, WACC, and WMCC

a. **Cost of Debt:** (approximate)

$$k_d = \frac{I + \frac{(\$1{,}000 - N_d)}{n}}{\frac{(N_d + \$1{,}000)}{2}}$$

$$k_d = \frac{\$100 + \frac{(\$1{,}000 - \$950)}{10}}{\frac{(\$950 + \$1{,}000)}{2}} = \frac{\$100 + \$5}{\$975} = 10.77\%$$

k_i = 10.77 x (l - .40)
k_i = 6.46%

Cost of Preferred Stock: $k_p = D_p \div N_p$

k_p = $8 ÷ $63 = 12.70%

Cost of Common Stock Equity: $k_s = (D_1 \div P_0) + g$

Growth rate:
$4.00 ÷ $2.85 = 1.403
Look for FVIF factor nearest 1.403.
From FVIF table:
g = 7%
Calculator solution: 7.1%
k_r = ($4.00 ÷ $50.00) + 7% = 15.00%

Cost of New Common Stock Equity:

k_n = ($4.00 ÷ $42.00) + 7% = 16.52%

b. Breaking point = $AF_j \div W_j$
$BP_{\text{common equity}}$ = [$7,000,000 x (1 - .6)*)] ÷ 0.50 = $5,600,000

Between $0 and $5,600,000, the cost of common stock equity is 15% because all common stock equity comes from retained earnings. Above $5,600,000, the cost of common stock equity is 16.52%. It is higher due to the flotation costs associated with a new issue of common stock.

* The firm expects to pay 60% of all earnings available to common shareholders as dividends.

c. WACC - $0 to $5,600,000:

L-T Debt	.40 x 6.46%	=	2.58%
Preferred stock	.10 x 12.70%	=	1.27%
Common stock	.50 x 15.00%	=	7.50%
	WACC	=	11.35%

d. WACC - above $5,600,000:

L-T Debt	.40 x	6.46%	=	2.58%
Preferred stock	.10 x	12.70%	=	1.27%
Common stock	.50 x	16.52%	=	8.26%
		WACC	=	12.11%

11-16 LG 2, 3, 4, 5: Calculation of Specific Costs, WACC, and WMCC

a. **Debt:** (approximate)

$$k_d = \frac{I + \frac{(\$1{,}000 - N_d)}{n}}{\frac{(N_d + \$1{,}000)}{2}}$$

$$k_d = \frac{\$80 + \frac{(\$1{,}000 - \$940)}{20}}{\frac{(\$940 + \$1{,}000)}{2}} = \frac{\$80 + \$3}{\$970} = 8.56\%$$

k_i = kd x (1 - t)
k_i = 8.56% x (1 - .40)
k_i = 5.1%

Preferred Stock:

$$k_p = \frac{D_p}{N_p}$$

$$k_p = \frac{\$7.60}{\$90} = 8.44\%$$

Common Stock:

$$k_n = \frac{D_j}{N_n} + g$$

$$k_p = \frac{\$7.00}{\$78} = .06 = .1497 = 14.97\%$$

Retained Earnings:

$$k_r = \frac{D_1}{P_0} + g$$

$$k_p = \frac{\$7.00}{\$90} = .06 = .1378 = 13.78\%$$

b. Breaking point = $\frac{AF_j}{W_i}$

(1) $BP_{\text{common equity}} = \frac{[\$100{,}000\ ]}{.50} = \$200{,}000$

	Type of Capital	Target Capital Structure %	Cost of Capital Source		Weighted Cost
(2)	WACC equal to or below $200,000 BP:				
	Long-term debt	.30	5.1%		1.53%
	Preferred stock	.20	8.4%		1.68%
	Common stock equity	.50	13.8%		6.90%
			WACC	=	10.11%
(3)	WACC above $200,000 BP:				
	Long-term debt	.30	5.1%		1.53%
	Preferred stock	.20	8.4%		1.68%
	Common stock equity	.50	15.0%		7.50%
			WACC	=	10.71%

11-17 LG 4, 5, 6: Integrative–WACC, WMCC, and IOS

a. Breaking Points and Ranges:

Source of Capital	Cost %	Range of New Financing	Breaking Point		Range of Total New Financing
Long-term debt	6	$0 - $320,000	$320,000 ÷ .40 =	$800,000	$0 - $800,000
	8	$320,001 and above			Greater than $800,000
Preferred stock	17	$0 and above			Greater than $0
Common stock Equity	20	$0 - $200,000	$200,000 ÷ .40 =	$500,000	$0 - $500,000
	24	$200,001 And above			Greater than $500,000

b. WACC will change at $500,000 and $800,000.

c. WACC:

Range of Total New Financing	Source of Capital (1)	Target Proportion (2)	Cost % (3)		Weighted Cost (2) x (3) (4)
$0 - $500,000	Debt	0.40	6		2.40%
	Preferred	0.20	17		3.40%
	Common	0.40	20		8.00%
			WACC	=	13.80%
$500,000 - $800,000	Debt	0.40	6%		2.40%
	Preferred	0.20	17%		3.40%
	Common	0.40	24%		9.60%
			WACC	=	15.40%
Greater than $800,000	Debt	0.40	8%		3.20%
	Preferred	0.20	17%		3.40%
	Common	0.40	24		9.60%
			WACC	=	16.20%

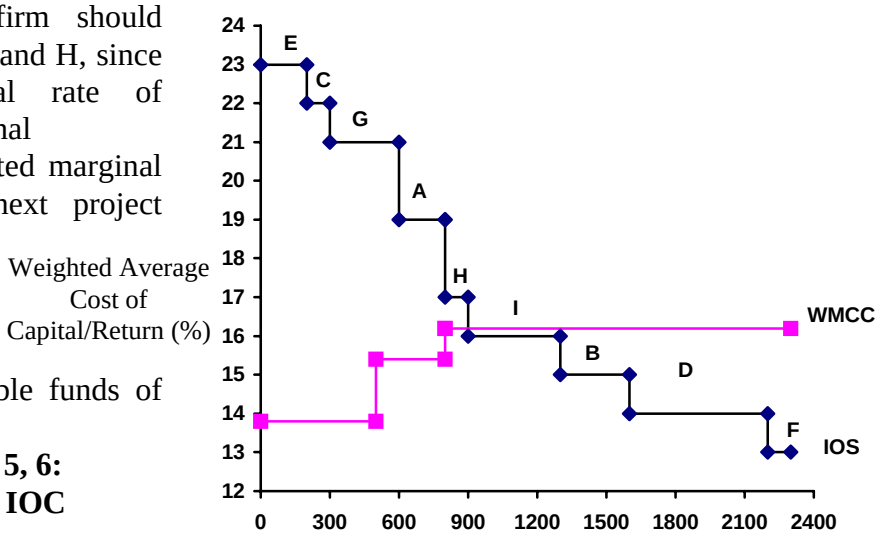
d. IOS Data for Graph

Investment	IRR	Initial Investment	Cumulative Investment
E	23%	$200,000	$200,000
C	22	100,000	300,000

G	21	300,000	600,000
A	19	200,000	800,000
H	17	100,000	900,000
I	16	400,000	1,300,000
B	15	300,000	1,600,000
D	14	600,000	2,200,000
F	13	100,000	2,300,000

IOS and WMCC

e. The firm should accept investments E, C, G, A, and H, since for each of these, the internal rate of return (IRR) on the investment exceeds the marginal cost of capital (WMCC). The next project (i.e., I) cannot be accepted since its return of 16% is below the weighted marginal cost of the available funds of 16.2%.



11-18 LG 4, 5, 6: Integrative–WACC, WMCC, and IOC

a. WACC: 0 to $600,000 = (.5)(6.3%) + (.1)(12.5%) + (.4)(15.3%)
= 3.15% + 1.25% + 6.12%
= 10.52%

WACC: $600,001 - $1,000,000 = (.5)(6.3%) + (.1)(12.5%) + (.4)(16.4%)
= 3.15% + 1.25% + 6.56%
= 10.96%

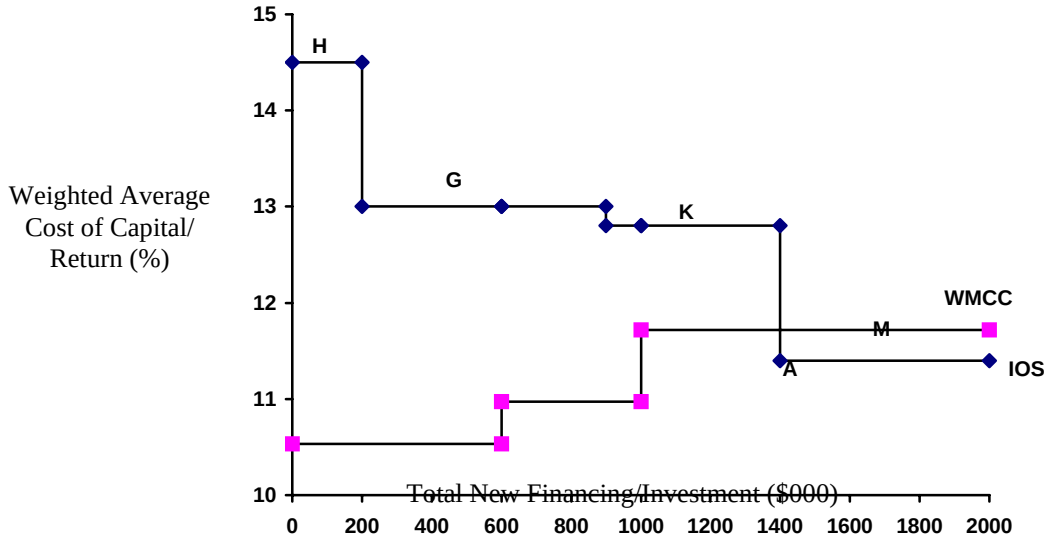
WACC: $1,000,001 and above = (.5) (7.8%) + (.1) (12.5%) + (.4) (16.4%)
= 3.9% + 1.25% + 6.56%
= 11.71%

See part c for the WMCC schedule.

b. All four projects are recommended for acceptance since the IRR is greater than the WMCC across the full range of investment opportunities.

c.

IOS and WMCC



d. In this problem, projects H, G, and K would be accepted since the IRR for these projects exceeds the WMCC. The remaining project, M, would be rejected because the WMCC is greater than the IRR.

CHAPTER 11 CASES
Making Star Products' Financing/Investment Decision

The Chapter 11 case, Star Products, is an exercise in evaluating the cost of capital and available investment opportunities. The student must calculate the component costs of financing, long-term debt, preferred stock, and common stock equity; determine the breaking points associated with each source; and calculate the weighted average cost of capital (WACC). Finally, the student must decide which investments to recommend to Star Products.

a. Cost of financing sources

Debt:

Below \$450,000:
$$k_d = \frac{I + \frac{(\$1{,}000 - N_d)}{n}}{\frac{(N_d + \$1{,}000)}{2}}$$

$$k_d = \frac{\$90 + \frac{(\$1{,}000 - \$960)}{15}}{\frac{(\$960 + \$1{,}000)}{2}}$$

$$k_d = \frac{\$92.67}{\$980} = .0946 = 9.46\%$$

$k_i = k_d \times (1 - t)$
$k_i = 9.46 \times (1 - .4)$
$k_i = 5.68\%$

Above \$450,000:
$k_i = k_d \times (1 - t)$
$k_i = 13.0 \times (1 - .4)$
$k_i = 7.8\%$

Preferred Stock:

$$k_p = \frac{D_p}{N_p}$$

$$k_p = \frac{\$9.80}{\$65} = .1508 = 15.08\%$$

Common Stock Equity:

\$0 - \$1,500,000:
$k_r = (D_i \div P_0) + g$
$k_r = (\$.96 \div \$12) + .11$
$k_r = .19$ or 19%

Above \$1,500,000:
$k_n = (D_i \div N_n) + g$

= ($.96 ÷ $9) + .11
= .2166 or 21.7%

b. Breaking points

$$\text{Breaking point} = \frac{AF_j}{W_i}$$

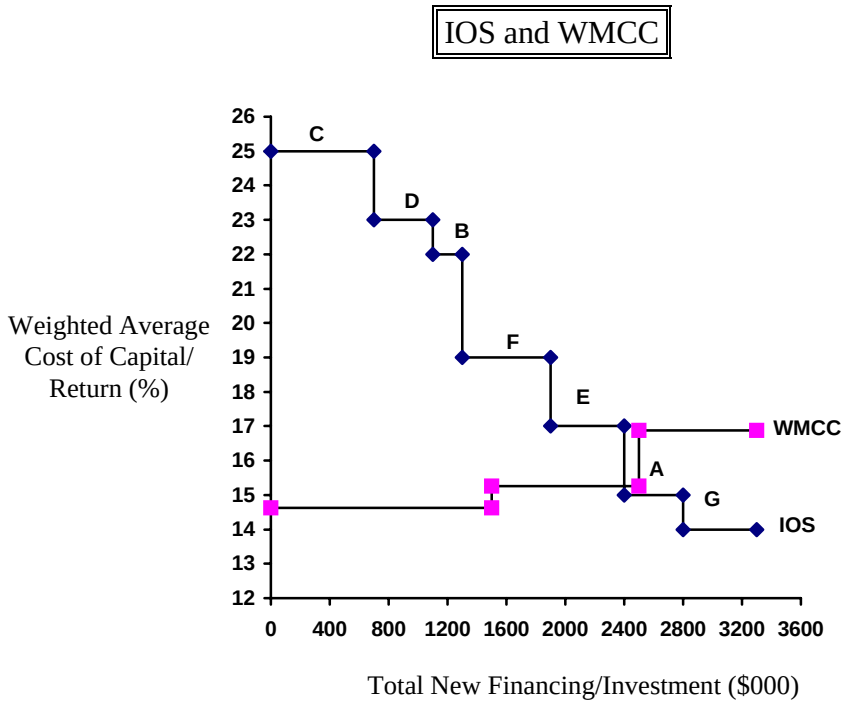
$$BP_{\text{Long-term debt}} = \frac{\$450{,}000}{.30} = \$1{,}500{,}000$$

$$BP_{\text{common equity}} = \frac{\$1{,}500{,}000}{.60} = \$2{,}500{,}000$$

c. Weighted average cost of capital:

(1) Type of Capital	Target Capital Structure	Cost of Capital Source		Weighted Cost
From $0 to $1,500,000:				
Long-term debt	.30	5.7%		1.71%
Preferred stock	.10	15.1%		1.51%
Common stock equity	.60	19.0%		11.40%
	1.00	WACC	=	14.62%
(2) From $1,500,000 to $2,500,000:				
Long-term debt	.30	7.8%		2.34%
Preferred stock	.10	15.1%		1.51%
Common stock equity	.60	19.0%		11.40%
	1.00	WACC	=	15.25%
(3) Above $2,500,000:				
Long-term debt	.30	7.8%		2.34%
Preferred stock	.10	15.1%		1.51%
Common stock equity	.60	21.7%		13.02%
	1.00	WACC	=	16.87%

d.



e. Projects C, D, B, F, and E should be accepted, because each has a return (IRR) greater than the weighted average cost of capital. These projects will require $2,400,000 in new financing.