Chapter 15

Long-Term Financing: An Introduction

15.1 Common Stock

Par and No-Par Stock

- The stated value on a stock certificate is called the *par value*.
  - Par value is an accounting value, not a market value.
  - The total par value (the number of shares multiplied by the par value of each share) is sometimes called the *dedicated capital* of the corporation.
- Some stocks have no par value.

Capital Surplus

- Usually refers to amounts of directly contributed equity capital in excess of the par value.
  - For example, suppose 1,000 shares of common stock having a par value of $1 each are sold to investors for $8 per share. The capital surplus would be

$$(\$8 - \$1) \times 1{,}000 = \$7{,}000$$

Retained Earnings

- Not many firms pay out 100 percent of their earnings as dividends.
- The earnings that are not paid out as dividends are referred to as *retained earnings*.

Market Value, Book Value, and Replacement Value

- Market Value is the price of the stock multiplied by the number of shares outstanding.
  - Also known as Market Capitalization
- Book Value
  - The sum of par value, capital surplus, and accumulated retained earnings is the *common equity* of the firm, usually referred to as the book value of the firm.
- Replacement Value
  - The current cost of replacing the assets of the firm.
- At the time a firm purchases an asset, market value, book value, and replacement value are equal.

Shareholders' equity

- The following is the equity section of the balance sheet for ABC:
  - Common Stock $1 par $875,000
  - Capital in excess of par $13,475,000

  Assume that ABC is newly formed corporation that just issued its outstanding shares of stock. What was the average price at which those shares were sold?

Shareholders’ equity

- Average price
- =($875,000+$13,475,000)/($875,000/$1)
- =$16.4

Retained Earnings

- Assume ABC has just completed its first year of operations which produced a net income of $63,800. ABC has decided to pay a dividend of $0.02 per share.
- What will be the value of retained earnings and book value at the beginning of next year?

Retained Earnings

- Retained earnings
- =net income – dividends paid
- =$63,800-875,000*$0.02
- =$46,300
- Book value
- =Total equity
- =875,000+13,475,000+46,300
- =14,396,300

Shareholders' Rights

- The right to elect the directors of the corporation by vote constitutes the most important control device of shareholders.

- The important difference is whether shares are to be voted cumulatively or straight.

Cumulative versus Straight Voting

- The effect of cumulative voting is to permit minority participation.
  - Under cumulative voting, the total number of votes that each shareholder may cast is determined first. Usually, the number of shares owned or controlled by a shareholder is multiplied by the number of directors to be elected. **Each shareholder can distribute these votes over one or more candidates.**
- Straight voting works like a U.S. political election.
  - Shareholders have as many votes as shares, and each position on the board has its own election.
  - **The maximum number of votes you can cast for any one candidate is the number of shares owned.**
  - There is a tendency to freeze out minority shareholders.

Cumulative vs. Straight Voting: Example 1

- Imagine a firm with two shareholders: A and B
  - A owns 60% of the firm (= 600 shares) and B owns 40% (= 400 shares).
  - There are three seats up for election on the board.
- Under straight voting, A may cast 600 votes for each candidate and as a result, he gets to pick all three seats.
- Under cumulative voting, B has 1,200 votes (= 400 shares × 3 seats) and A has1,800.
- If B gives all her votes to one board member, she can elect at least one board member.

Corporate Voting Example 2

- Mike owns 750 shares of Company ABC. Currently, the shareholders of ABC are in the process of electing three new directors to the company's board. Mike would like to be elected as one of the new directors.
- How many votes can Mike cast for himself if the firm uses straight voting? If the firm uses cumulative voting?
- Can Mike get himself elected in either situation if there are 2,200 shares of stock outstanding?

Corporate Voting Example Cont.

- Straight voting: 750
- Cumulative voting: 750*3=2,250

Corporate Voting Example Cont.

Straight voting:	
Total votes per position	2200
Less: Mike's votes for himself	750
Votes available from other shareholders	1450

Mike cannot guarantee himself a seat

Cumulative Voting:	
Total Votes for all positions	2200*3=6600
Less: Mike's votes for himself	2250
Votes available from other shareholders	4350

Mike can be assured of being elected

Dividends

- Unless a dividend is declared by the board of directors of a corporation, it is not a liability of the corporation.
  - A corporation cannot *default* on an undeclared dividend.
- The payment of dividends by the corporation is not a business expense.
  - Therefore, they are not tax-deductible.
- Dividends received by individual shareholders are, for the most part, considered ordinary income by the IRS and are fully taxable.

15.2 Corporate Long-Term Debt: The Basics

Interest versus Dividends

- Debt is not an ownership interest in the firm. Creditors do not usually have voting power.
- The corporation's payment of interest on debt is considered a cost of doing business and is fully tax-deductible.
- Dividends are paid out of after-tax dollars.
- Unpaid debt is a liability of the firm. If it is not paid, the creditors can legally claim the assets of the firm.

Basic Features of Long-Term Debt

- The bond indenture usually lists
  - Amount of Issue, Date of Issue, Maturity
  - Denomination (Par value)
  - Annual Coupon, Dates of Coupon Payments
  - Security
  - Sinking Funds
  - Call Provisions
  - Covenants
- Features that may change over time
  - Rating
  - Yield-to-Maturity
  - Market price

Difference B/T Debt and Equity

	Debt	Equity
Repayment is an obligation of the firm	Yes	No
Grants ownership of the firm	No	Yes
Provides a tax shield	Yes	No
Liquidation will result if not paid	Yes	No

Debt versus Equity

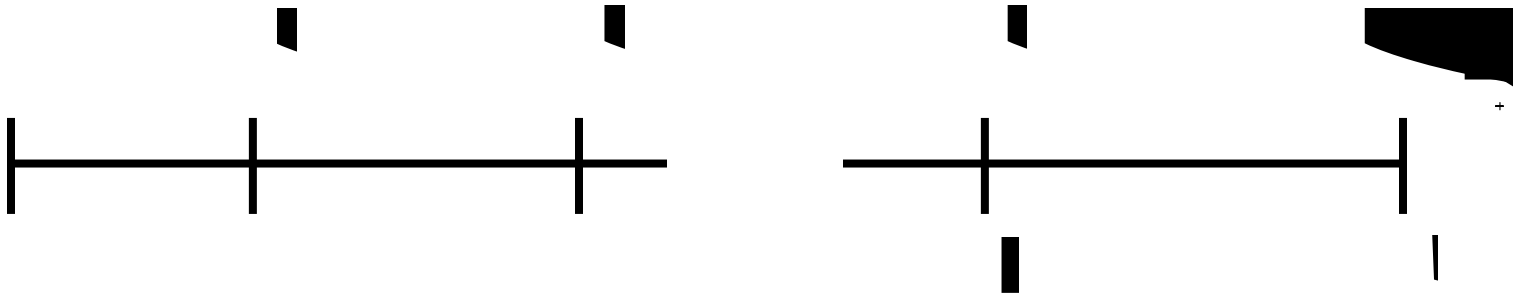
- Debt
  - Not an ownership interest
  - Creditors do not have voting rights
  - **Interest is considered a cost of doing business and is tax deductible**
  - Creditors have legal recourse if interest or principal payments are missed
  - **Excess debt can lead to financial distress and bankruptcy**
- Equity
  - Ownership interest
  - Common stockholders vote for the board of directors and other issues
  - **Dividends are not considered a cost of doing business and are not tax deductible**
  - **Dividends are not a liability of the firm, and stockholders have no legal recourse if dividends are not paid**
  - **An all-equity firm cannot go bankrupt**

Zero Coupon Bonds

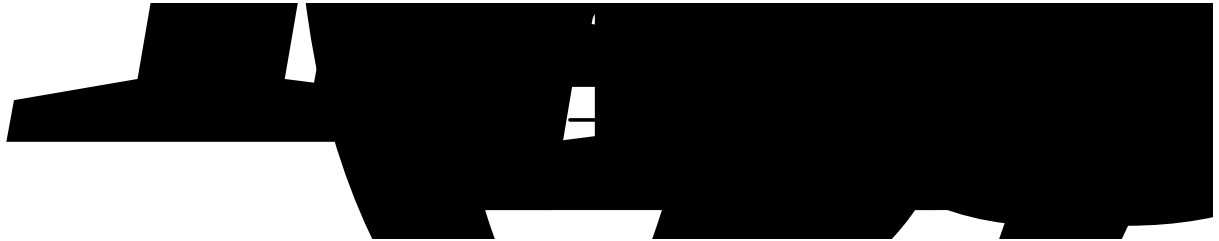
- Make no periodic interest payments (coupon rate = 0%)
- The entire yield to maturity comes from the difference between the purchase price and the par value
- Cannot sell for more than par value
- Sometimes called zeroes, deep discount bonds, or original issue discount bonds (OIDs)
- Treasury Bills and principal-only Treasury strips are good examples of zeroes

Pure Discount Bonds: Example

Find the value of a 15-year zero-coupon bond with a $1,000 par value and a YTM of 12%.



Normally, zero coupon bonds are priced with semiannual compounding to correspond with coupon bonds.



Pure Discount Bonds: Example Cont.

- If you hold the bond for the entire year, how much in interest income will you have to declare on your tax return?
- The price at the end of one year is:

- So, the implied interest, which will be taxable as interest income, is:
-
- Implied interest = $195.63 – 174.11=$21.52
-

Coupon Bond

- Bond price is the present value of the coupons and par value.
- Find the value of a 15-year 8% coupon bond with a $1,000 par value and a YTM of 12%.

$$PV = \frac{F}{(1+r)^T} = \sum_{i=1}^{30} \frac{\$40}{(1+r)^i} + \frac{\$1{,}000}{(1.06)^{30}} = \$724.70$$

Example

- You bought a 12% coupon bond with $1,000 par value. The bond maturity is 30 years. Your required rate of return is 10%.
- You hold the bond for 1 year. How much in interest income will you have to declare on your tax return?

Floating Rate Bonds

- Coupon rate floats depending on some index value
- Examples – adjustable rate mortgages and inflation-linked Treasuries
- There is less price risk with floating rate bonds.
  - The coupon floats, so it is less likely to differ substantially from the yield to maturity.
- Coupons may have a “collar” – the rate cannot go above a specified “ceiling” or below a specified “floor.”

Treasury Inflation Protected Securities (TIPS)

- The par value and coupon payments increase in direct proportion to the Consumer Price Index.
  - For example: Consider a newly issued bond with a 3-year maturity, par value of $1,000, and coupon rate of 4% with annual payment. Assume that inflation turns out to be 2%, 3% and 1% in the next 3 years.

Principal and Interest Payments for a Treasury Inflation Protected Security

TABLE 14.1

Principal and interest payments for a Treasury Inflation Protected Security

Time	Inflation in Year Just Ended	Par Value	Coupon Payment	+	Principal Repayment	=	Total Payment
0		$1,000.00					
1	2%	1,020.00	$40.80		$ 0		$ 40.80
2	3	1,050.60	42.02		0		42.02
3	1	1,061.11	42.44		1,061.11		1,103.55

15.3 Preferred Stock

- Represents equity of a corporation, but is different from common stock because it has preference over common in the payments of dividends and in the assets of the corporation in the event of bankruptcy.
- Preferred shares have a stated liquidating value, usually $100 per share.

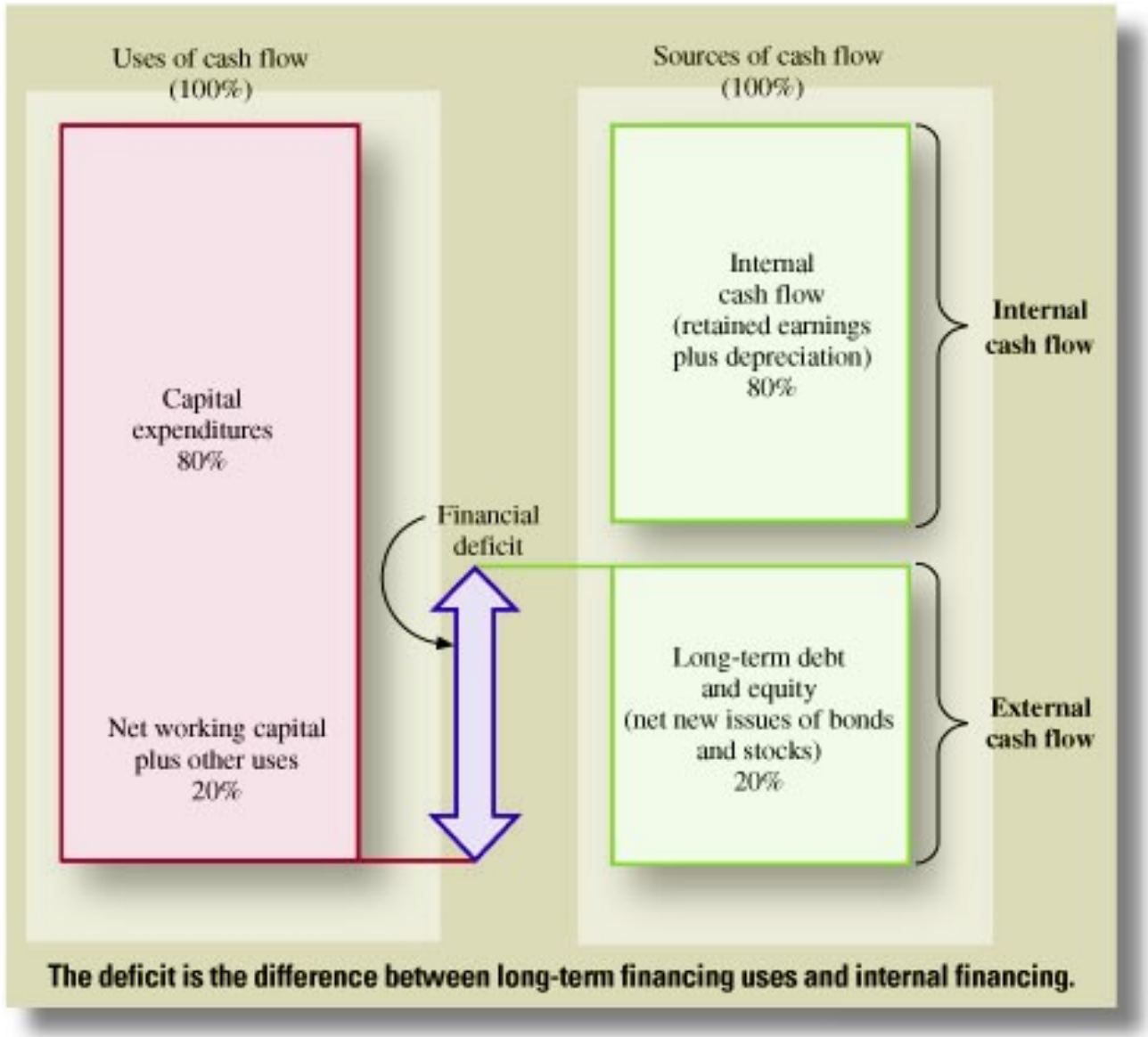
The differences between preferred stock and debt

- The dividends on preferred stock cannot be deducted as interest expense when determining taxable corporate income.
  - From the individual investor's point of view, preferred dividends are ordinary income for tax purposes. From corporate investors, 70% of the amount they receive as dividends from preferred stock are exempt from income taxes.
- In case of liquidation (at bankruptcy), preferred stock is junior to debt and senior to common stock.
- There is no legal obligation for firms to pay out preferred dividends as opposed to the obligated payment of interest on bonds.

15.4 Patterns of Financing

- Internally generated cash flow dominates as a source of financing, typically between 70 and 90%.
- Firms usually spend more than they generate internally —the deficit is financed by new sales of debt and equity.
- Net new issues of equity are less than new sales of debt.
- This is consistent with the pecking order hypothesis.
- Firms in other countries rely to a greater extent than U.S. firms on external equity.

Figure 15.2
The Long-Term Financial Deficit



Reading Assignment

Please read the related pages for the following topics.

Authorized vs. Issued Common Stock

- The articles of incorporation must state the number of shares of common stock the corporation is authorized to issue.
- The board of directors, after a vote of the shareholders, may amend the articles of incorporation to increase the number of shares.
  - Authorizing a large number of shares may worry investors about *dilution* because authorized shares can be issued later with the approval of the board of directors but without a vote of the shareholders.

Proxy Voting

- A proxy is the legal grant of authority by a shareholder to someone else to vote his or her shares.
- For convenience, the actual voting in large public corporations is usually done by proxy.

Classes of Stock

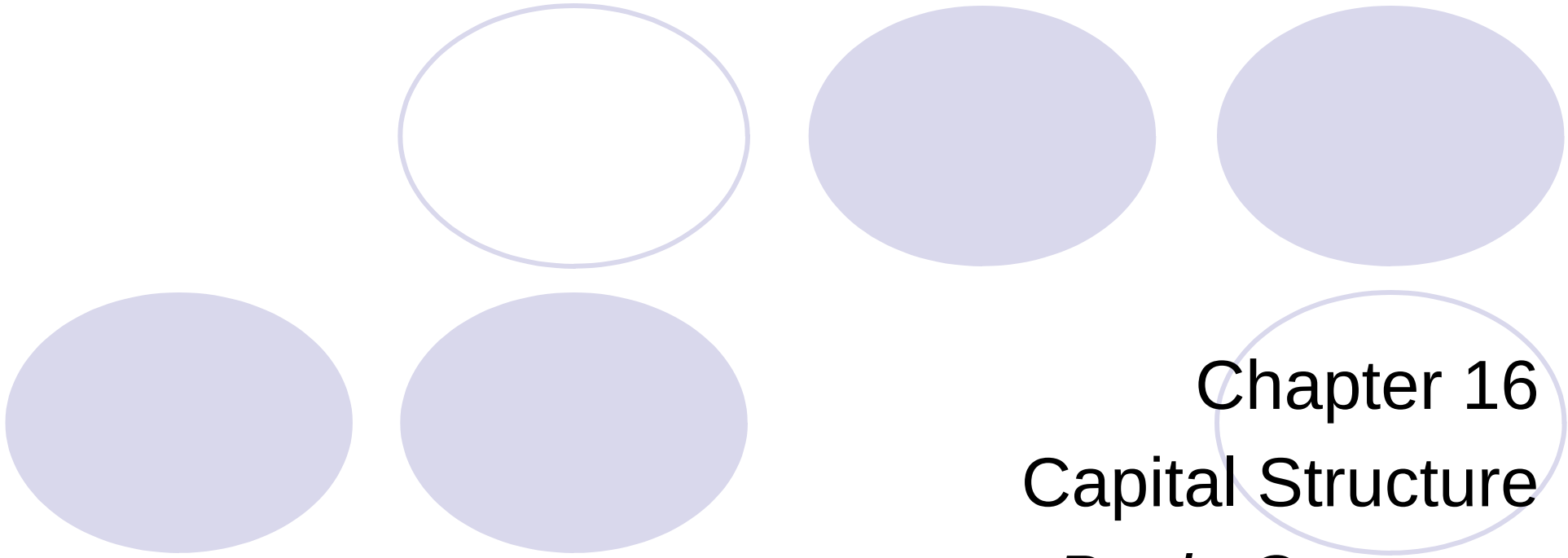
- When more than one class of stock exists, they are usually created with unequal voting rights.
- Many companies issue dual classes of common stock. The reason has to do with control of the firm.
- Lease, McConnell, and Mikkelson found the market prices of stocks with superior voting rights to be about 5 percent higher than the prices of otherwise-identical stocks with inferior voting rights.

The preferred Stock Puzzle

- There are two offsetting tax effects to consider in evaluating preferred stock:
  1. Dividends are not deducted from corporate income in computing the tax liability of the issuing corporation.
  2. When a corporation buys preferred stock, a portion of the dividends received are exempt from corporate taxation.

Different Types of Debt

- A *debenture* is an unsecured corporate debt, whereas a *bond* is secured by a mortgage on the corporate property.
- A *note* usually refers to an unsecured debt with a maturity shorter than that of a debenture, perhaps under 10 years.



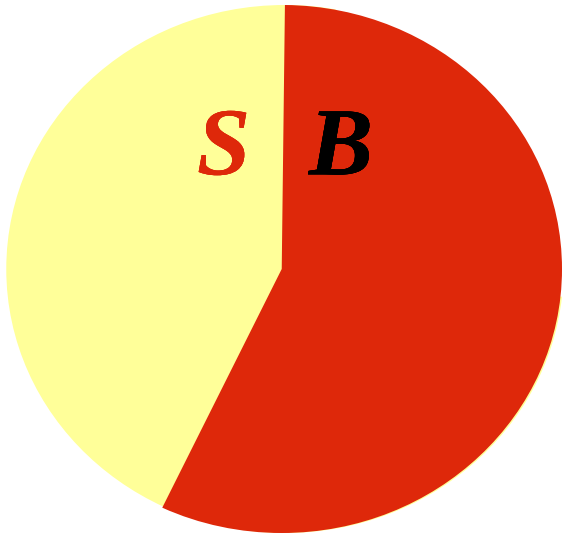
Chapter 16
Capital Structure
Basic Concepts

16.1 Capital Structure and the Pie

- The value of a firm is defined to be the sum of the value of the firm's debt and the firm's equity.

  $V = B + S$

  - If the goal of the firm's management is to make the firm as valuable as possible, then the firm should pick the debt-equity ratio that makes the pie as big as possible.



Value of the Firm

Stockholder Interests

There are two important questions:

1. Why should the stockholders care about maximizing *firm* value? Perhaps they should be interested in strategies that maximize *shareholder* value.
2. What is the ratio of debt-to-equity that maximizes the shareholder's value?

Changes in capital structure benefit the stockholders *if and only if* the value of the firm increases.

16.3 Financial Leverage, EPS, and ROE (No Tax)

Consider an all-equity firm that is contemplating going into debt. (Maybe some of the original shareholders want to cash out.)

	Current	Proposed
Assets	$20,000	$20,000
Debt	$0	$8,000
Equity	$20,000	$12,000
Debt/Equity ratio	0.00	2/3
Interest rate	n/a	8%
Shares outstanding	400	240
Share price	$50	$50

16.3 Financial Leverage, EPS, and ROE (No Tax)

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EPS and ROE Under Current Structure (All Equity, No Debt and No Taxes)

	Recession	Expected	Expansion
EBIT	$1,000	$2,000	$3,000
Interest	0	0	0
Net income	$1,000	$2,000	$3,000
EPS	$2.50	$5.00	$7.50
ROA	5%	10%	15%
ROE	5%	10%	15%

Current Shares Outstanding = 400 shares

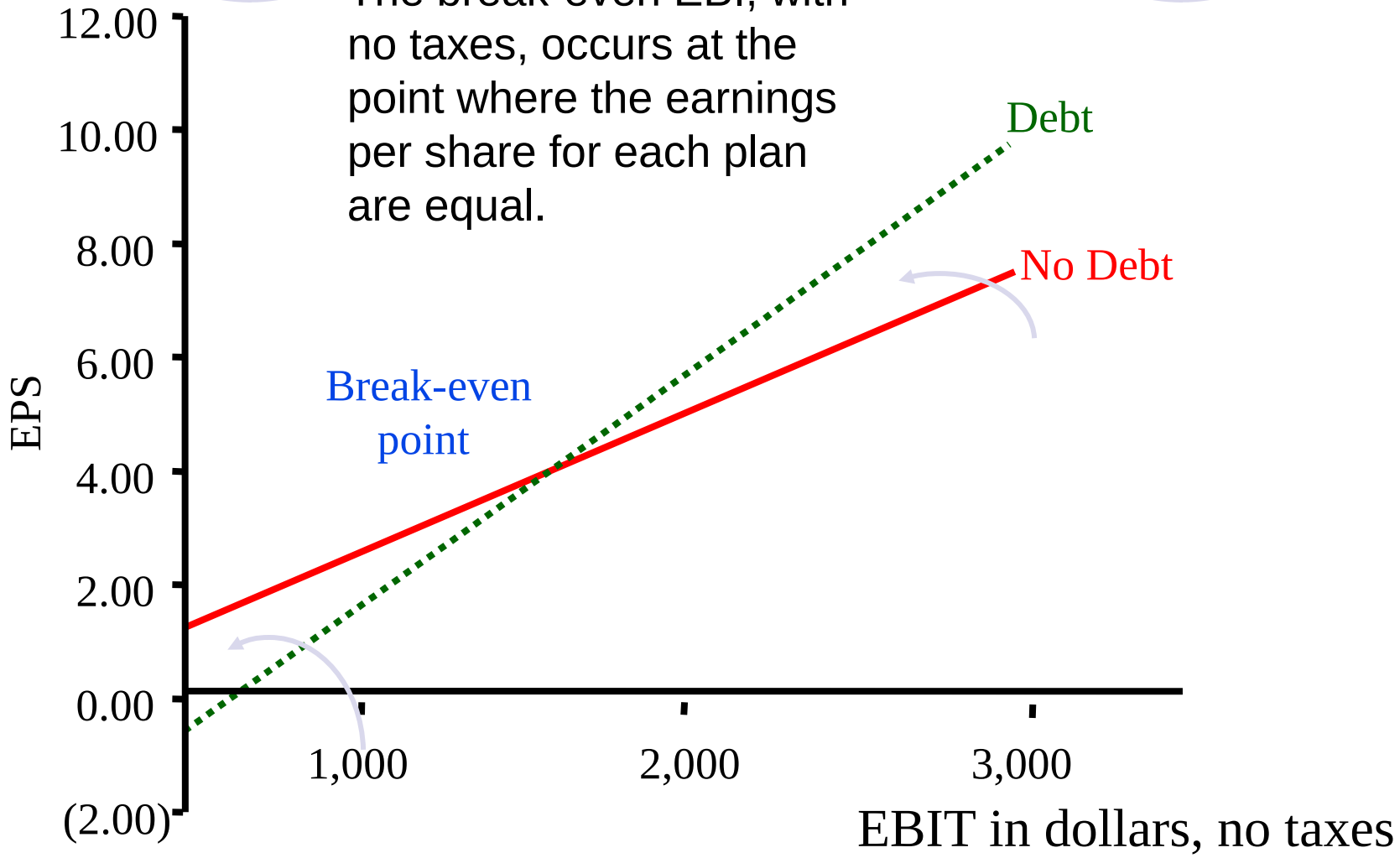
EPS and ROE Under Proposed Structure ($8,000 Debt with 8% interest and No Taxes)

	Recession	Expected	Expansion
EBIT	$1,000	$2,000	$3,000
Interest	640	640	640
Net income	$360	$1,360	$2,360
EPS	$1.50	$5.67	$9.83
ROA	1.8%	6.8%	11.8%
ROE	3.0%	11.3%	19.7%

Proposed Shares Outstanding = 240 shares

Financial Leverage and EPS

The break-even EBI, with no taxes, occurs at the point where the earnings per share for each plan are equal.



5: Break-even EBI, no tax

You are considering two different capital structures. Plan A consists of 30,000 shares of stock. Plan B consists of 20,000 shares of stock plus $350,000 of debt. The interest rate is 9% and there are no taxes.

What is the break-even level of EBI between these two plans?

What is the break-even level of EPS?

If EBI is $78,000, which plan will produce the higher EPS?

$$\frac{EBI}{30{,}000} = \frac{EBI - (\$350{,}000 \times .09)}{20{,}000}$$

$$20{,}000EBI = 30{,}000EBI - 30{,}000(\$31{,}500)$$

$$10{,}000EBI = \$945{,}000{,}000$$

$$EBI = \$94{,}500$$

$$\text{Break-even EPS} = \frac{\$94{,}500}{30{,}000} = \frac{\$94{,}500 - (\$350{,}000 \times .09)}{20{,}000} = \$3.15$$

$$\text{Unlevered EPS} = \frac{\$78{,}000}{30{,}000} = \$2.60$$

$$\text{Levered EPS} = \frac{\$78{,}000 - (\$350{,}000 \times .09)}{20{,}000} = \$2.33$$

Homemade Leverage (No Tax)

- Homemade leverage refers to the use of borrowing on the personal level as opposed to the corporate level.
- Firms and investors can borrow/lend at the same rate

Homemade Leverage (No Tax) : An Example

We are buying 40 shares of a $50 stock, using $800 in margin.

Our personal debt-equity ratio is: $\frac{B}{S} = \frac{\$800}{\$1{,}200} = 2/3$

	Recession	Expected	Expansion
EPS of Unlevered Firm	*$2.50*	*$5.00*	*$7.50*
Earnings for 40 shares	$100	$200	$300
Less interest on $800 (8%)	$64	$64	$64
Net Profits	$36	$136	$236
ROE (Net Profits / $1,200)	3.0%	11.3%	19.7%

We get the same ROE as if we bought into a levered firm.

We can create a levered position by adjusting the trading in our own account.

Homemade (Un)Leverage (No Tax) : An Example

Buying 24 shares of an otherwise identical levered firm along with $800 of the firm's debt.

	Recession	Expected	Expansion
EPS of Levered Firm	*$1.50*	*$5.67*	*$9.83*
Earnings for 24 shares	$36	$136	$236
Plus interest on $800 (8%)	$64	$64	$64
Net Profits	$100	$200	$300
ROE (Net Profits / $2,000)	5%	10%	15%

This gets us to the ROE of the unlevered firm.

We can create an unlevered position by adjusting the trading in our own account.

Homemade Leverage (No Tax)

Utilsworth, Inc., is an all-equity firm with EBI of $460,000. There are 115,000 shares of stock outstanding at a market price of $40 a share. Utilsworth has just decided to issue $1.15 million of debt at a rate of 8.5% to repurchase shares of stock. Katie owns 25,000 shares of this stock and wants to use homemade leverage to offset the leverage being assumed by the firm. Ignore taxes.

How many shares of stock must Katie sell to achieve her goal if she loans out the funds from the stock sale at 8.5% interest?

Homemade Leverage (No Tax)

$$\text{Interest} = \$1{,}150{,}000 \times .085 = \$97{,}750$$

$$\text{Shares repurchased} = \frac{\$1{,}150{,}000}{\$40} = 28{,}750 \text{ shares}$$

$$\text{Shares outstanding with debt} = 115{,}000 - 28{,}750 = 86{,}250$$

Homemade Leverage Company (No Tax)

		Weights
Stock: 86,250 × $40	= $3,450,000	75%
Debt:	= $1,150,000	25%
Total:	$4,600,000	100%

Homemade Leverage (No Tax)

Investment = 25,000 × $40 = $1,000,000

Stock:
75% of $1,000,000 = $750,000
$750,000 ÷ $40 = 18,750 shares

Shares to be sold:
25,000 shares - 18,750 shares = 6,250 shares
Sale proceeds = 6,250 shares × $40 = $250,000

Loan out:
25% of $1,000,000 = $250,000

MM Proposition I (No Taxes)

- We can create a levered or unlevered position by adjusting the trading in our own account.
- This homemade leverage suggests that capital structure is irrelevant in determining the value of the firm:

$$V_L = V_U$$

M&M Proposition I No Tax

A debt-free firm currently has 650,000 shares of stock outstanding. The company is considering reducing the number of shares to 500,000. To do this, the firm will have to borrow $11 million at 7.5% interest.

Ignoring taxes, what is the value of the firm?

M&M Proposition I No Tax

$$\text{Price per share} = \frac{\$11 \text{ million}}{650{,}000 - 500{,}000} = \frac{\$11 \text{ million}}{150{,}000} = \$73.333333$$

$$V_U = V_L$$
$$650{,}000 \times \$73.333333 = (500{,}000 \times \$73.333333) + \$11{,}000{,}000$$
$$\$47{,}666{,}667 = \$36{,}666{,}667 + \$11{,}000{,}000$$
$$\$47{,}666{,}667 = \$47{,}666{,}667$$

16.4 MM Proposition II (No Taxes)

- Proposition II
  - Leverage increases the risk and return to stockholders

$$R_s = R_0 + (B / S_L)(R_0 - R_B)$$

R_B is the interest rate (cost of debt)

R_s is the return on (levered) equity (cost of equity)

R_0 is the return on unlevered equity (cost of capital)

B is the value of debt

S_L is the value of levered equity

MM Proposition II (No Taxes)

The derivation is straightforward:

$$R_{WACC} = \frac{B}{B+S} \times R_B + \frac{S}{B+S} \times R_S \qquad \text{Then set } R_{WACC} = R_0$$

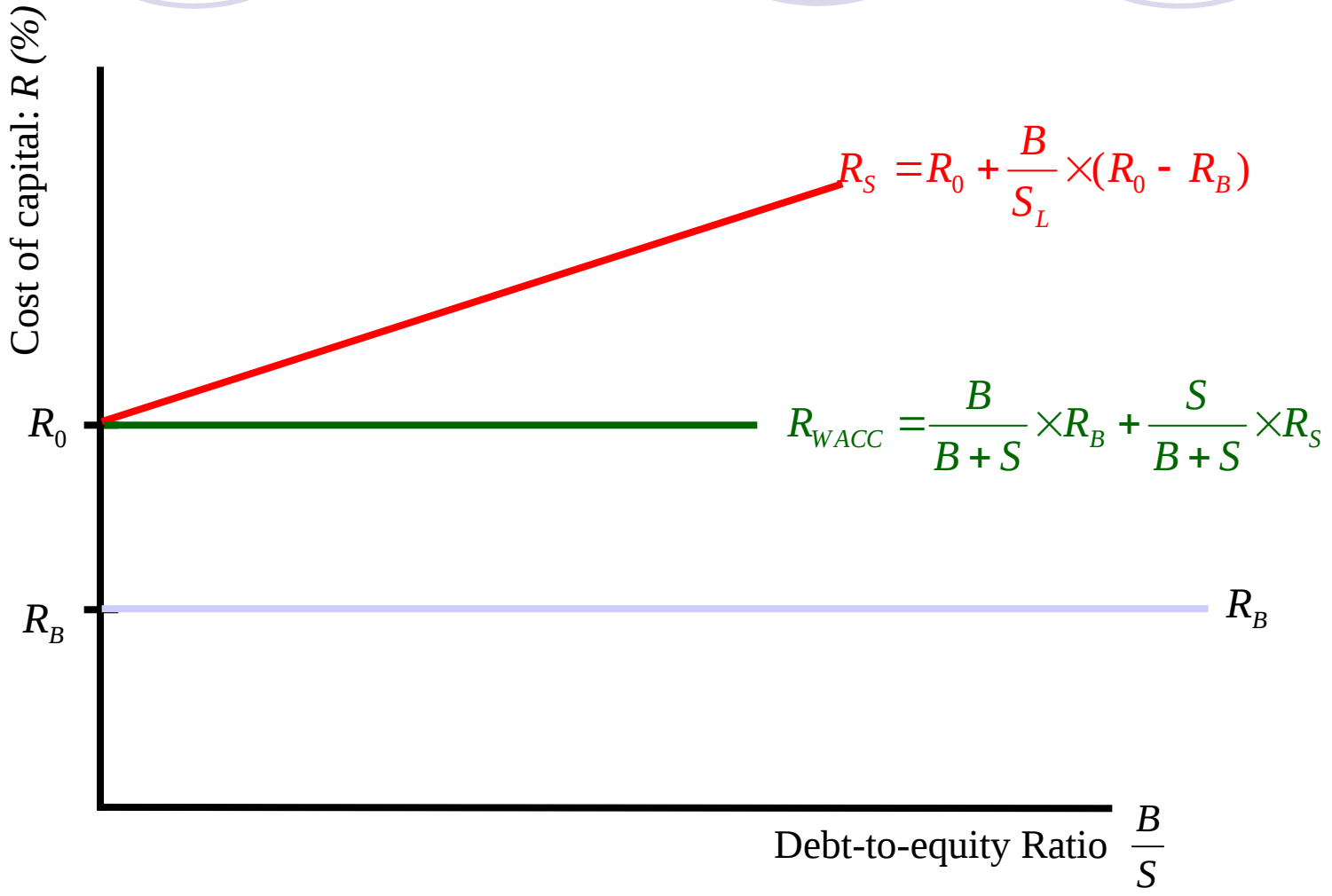
$$\frac{B}{B+S} \times R_B + \frac{S}{B+S} \times R_S = R_0 \quad \text{multiply both sides by } \frac{B+S}{S}$$

$$\frac{B+S}{S} \times \frac{B}{B+S} \times R_B + \frac{B+S}{S} \times \frac{S}{B+S} \times R_S = \frac{B+S}{S} R_0$$

$$\frac{B}{S} \times R_B + R_S = \frac{B+S}{S} R_0$$

$$\frac{B}{S} \times R_B + R_S = \frac{B}{S} R_0 + R_0 \qquad R_S = R_0 + \frac{B}{S}(R_0 - R_B)$$

MM Proposition II (No Taxes)



MM Proposition II (No Taxes)

Designer Interiors is currently an all-equity firm with a cost of capital of 14%. Should the firm opt to borrow money, it can do so at 8.5%. Ignore taxes.

What is the firm's current cost of equity?

What will the cost of equity be if the firm changes its structure to a debt-equity ratio of .7?

What will the firm's WACC be if the debt-equity ratio is .7?

MM Proposition II (No Taxes)

$$R_S = R_0 + \frac{B}{S}(R_0 - R_B)$$
$$= .14 + \frac{.7}{1}(.14 - .085)$$
$$= .14 + .0385$$
$$= .1785$$
$$= 17.85\%$$

$$R_0 = R_{WACC} = 14\%$$

$$R_{WACC} = \frac{S}{B+S}(R_S) + \frac{B}{B+S}(R_B)$$
$$= \frac{1}{1.7}(.1785) + \frac{.7}{1.7}(.085)$$
$$= .105 + .035$$
$$= .14$$
$$= 14\%$$

Summary: No Taxes

- In a world of no taxes, the value of the firm is unaffected by capital structure.
- This is M&M Proposition I:

$$V_L = V_U$$

- Proposition I holds because shareholders can achieve any pattern of payouts they desire with homemade leverage.
- In a world of no taxes, M&M Proposition II states that leverage increases the risk and return to stockholders.

$$R_S = R_0 + \frac{B}{S_L} \times (R_0 - R_B)$$

16.5 MM Propositions I (With Taxes)

- Proposition I (with Corporate Taxes)
  - Firm value increases with leverage

$$V_L = V_U + T_C B$$

MM Proposition I (With Taxes)

The total cash flow to all stakeholders is

$$(EBIT - R_B B) \times (1 - T_C) + R_B B$$

The present value of this stream of cash flows is V_L

Clearly $(EBIT - R_B B) \times (1 - T_C) + R_B B =$

$$= EBIT \times (1 - T_C) - R_B B \times (1 - T_C) + R_B B$$

$$= EBIT \times (1 - T_C) - \cancel{R_B B} + R_B B T_C + \cancel{R_B B}$$

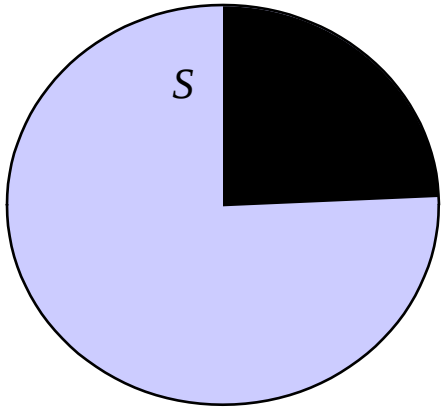
The present value of the first term is V_U

The present value of the second term is $T_C B$

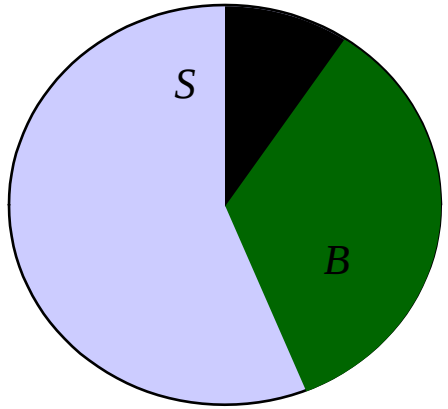
$$\therefore V_L = V_U + T_C B$$

Total Cash Flow to Investors

All-equity firm



Levered firm



The levered firm pays less in taxes than does the all-equity firm.

Thus, the sum of the debt plus the equity of the levered firm is greater than the equity of the unlevered firm.

This is how cutting the pie differently can make the pie “larger.”

-the government takes a smaller slice of the pie!

MM Proposition I (With Taxes)

Dover United is an all-equity firm with earnings before interest and taxes of $68,400. The unlevered cost of capital is 11.4%. The company is considering adding $40,000 of debt with a coupon rate of 9%. The debt will sell at par. The tax rate is 34%.

What will the value of Dover United be after they add the debt to the capital structure?

What is the value of the levered equity?

MM Proposition I (With Taxes)

$$V_L = V_U + t_C B$$

$$V_L = \frac{EBIT \times (1 - t_c)}{R_o} + t_C B$$

$$= \frac{\$68,400 \times (1 - .34)}{.114} + (.34 \times \$40,000)$$

$$= \$396,000 + \$13,600$$

$$= \$409,600$$

$$V_B = \$40,000$$

$$V_S = V_L - V_B$$

$$= \$409,600 - \$40,000$$

$$= \$369,600$$

MM Propositions II (With Taxes)

- Proposition II (with Corporate Taxes)
  - Some of the increase in equity risk and return is offset by the interest tax shield

$$R_S = R_0 + (B/S)\times(1-T_C)\times(R_0 - R_B)$$

R_B is the interest rate (cost of debt)

R_S is the return on equity (cost of equity)

R_0 is the return on unlevered equity (cost of capital)

B is the value of debt

S is the value of levered equity

MM Proposition II (With Taxes)

Start with M&M Proposition I with taxes: $V_L = V_U + T_C B$

Since $V_L = S + B \Rightarrow S + B = V_U + T_C B$

$$V_U = S + B(1 - T_C)$$

The cash flows from each side of the balance sheet must equal:

$$SR_S + BR_B = V_U R_0 + T_C B R_B$$

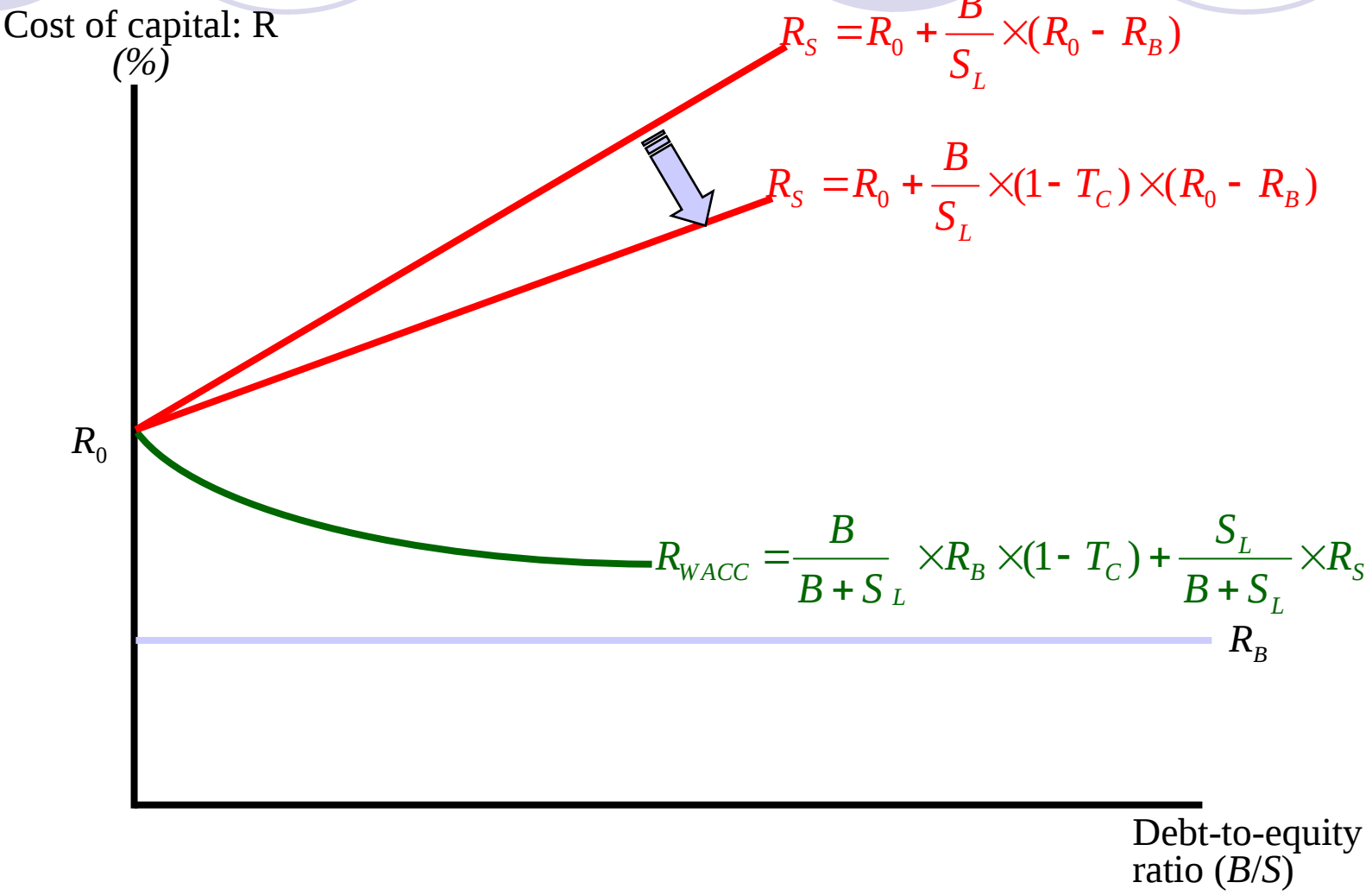
$$SR_S + BR_B = [S + B(1 - T_C)]R_0 + T_C R_B B$$

Divide both sides by S

$$R_S + \frac{B}{S} R_B = [1 + \frac{B}{S}(1 - T_C)]R_0 + \frac{B}{S} T_C R_B$$

Which quickly reduces to $R_S = R_0 + \frac{B}{S} \times (1 - T_C) \times (R_0 - R_B)$

The Effect of Financial Leverage



Total Cash Flow to Investors

All Equity

	Recession	Expected	Expansion
EBIT	$1,000	$2,000	$3,000
Interest	0	0	0
EBT	$1,000	$2,000	$3,000
Taxes (*T*c = 35%)	$350	$700	$1,050
Total Cash Flow to S/H	$650	$1,300	$1,950

Levered

	Recession	Expected	Expansion
EBIT	$1,000	$2,000	$3,000
Interest ($800 @ 8%)	640	640	640
EBT	$360	$1,360	$2,360
Taxes (*Tc* = 35%)	$126	$476	$826
Total Cash Flow	$234+640	$884+$640	$1,534+$640
(to both S/H & B/H):	$874	$1,524	$2,174
EBIT(1-Tc)+$T_C R_B B$	$650+$224	$1,300+$224	$1,950+$224
	$874	$1,524	$2,174

MM Propositions II (With Taxes)

Charleston Mills has $645,000 in bonds outstanding that are selling at par. The value of the equity is $829,000. The bonds have a 7.5% coupon rate and pay interest annually. The expected EBIT is $160,000 and the unlevered cost of capital is 12%. The tax rate is 35%.

What is the levered cost of equity?

MM Propositions II (With Taxes)

$$R_S = R_0 + \frac{B}{S} \times (1 - t_c) \times (R_0 - R_B)$$

$$= .12 + \frac{\$645{,}000}{\$829{,}000} \times (1 - .35) \times (.12 - .075)$$

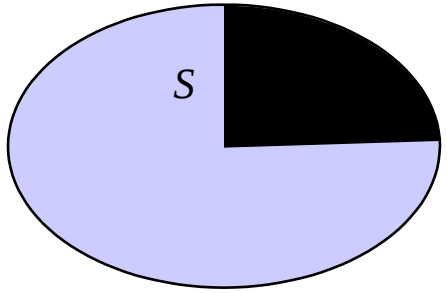
$$= .12 + .0228$$

$$= .1428$$

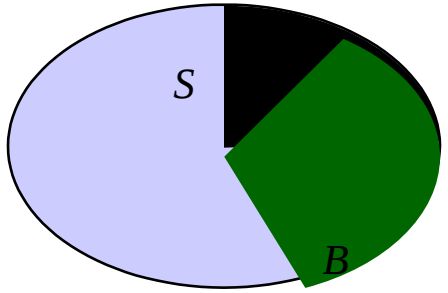
$$= 14.28\%$$

Total Cash Flow to Investors

All-equity firm



Levered firm



The levered firm pays less in taxes than does the all-equity firm.

Thus, the sum of the debt plus the equity of the levered firm is greater than the equity of the unlevered firm.

This is how cutting the pie differently can make the pie “larger.”

-the government takes a smaller slice of the pie!

Summary: Taxes

- In a world of taxes, but no bankruptcy costs, the value of the firm increases with leverage.
- This is M&M Proposition I:

$$V_L = V_U + T_C B$$

- Proposition I holds because corporations can deduct interest payments but not dividend payments, corporate leverage lowers tax payments.
- In a world of taxes, M&M Proposition II states that leverage increases the risk and return to stockholders.

$$R_S = R_0 + \frac{B}{S_L} \times (1 - T_C) \times (R_0 - R_B)$$

Summary: Taxes

- In a world of taxes, but no bankruptcy costs, the value of the firm increases with leverage.
- This is M&M Proposition I:

$$V_L = V_U + T_C B$$

- Proposition I holds because shareholders can achieve any pattern of payouts they desire with homemade leverage.
- In a world of taxes, M&M Proposition II states that leverage increases the risk and return to stockholders.

$$R_S = R_0 + \frac{B}{S_L} \times (1 - T_C) \times (R_0 - R_B)$$

Chapter 17
Capital Structure
Limits to the Use of Debt

17.1 Costs of Financial Distress

- The possibility of bankruptcy has a negative effect on the value of the firm.
- It is the costs associated with bankruptcy that lowers firm value.
- It is the stockholders who bear these costs.

Plato & Co. estimates its cash flow as $200 for its final year in business if the economy booms. If the economy is normal, the estimated cash flow is $60 for the year. There is a 55% chance of an economic boom and a 45% chance of a normal economy. The firm has a principal and interest payment of $75 on previously incurred debt that is due at the end of the year. The current interest rate is 9%.

What is the current value of the firm if you ignore bankruptcy costs?

What is the value of the firm if you consider the bankruptcy costs of $12?

	Cash flows ignoring costs	
	Boom	Normal
Cash flow	$200	$60
Payment to bondholders	$75	$60
Payment to stockholders	$125	$0

$$S = \frac{.55 \times \$125 + .45 \times \$0}{1.09} = \frac{\$68.75 + \$0}{1.09} = \$63.07$$

$$B = \frac{.55 \times \$75 + .45 \times \$60}{1.09} = \frac{\$41.25 + \$27.00}{1.09} = \$62.61$$

V=S+B=$63.07+$62.61=$125.68

	Cash flows with costs	
	Boom	Normal
Cash flow	$200	$60
Payment to bondholders	$75	$48
Payment to stockholders	$125	$0

$$S = \frac{.55 \times \$125 + .45 \times \$0}{1.09} = \frac{\$68.75 + \$0}{1.09} = \$63.07$$

$$B = \frac{.55 \times \$75 + .45 \times \$48}{1.09} = \frac{\$41.25 + \$21.60}{1.09} = \$57.66$$

V=S+B=$63.07+$57.66=$119.73

17.2 Description of Financial Distress Costs

- Agency Costs
  - between bondholders and stockholders.
  - When a firm is in financial distress, investment strategies that maximize firm value may no longer maximize the value of stockholders.
  - Selfish Strategy 1: Incentive to take large risks
  - Selfish Strategy 2: Incentive toward underinvestment
  - Selfish Strategy 3: Milking the property

Example: Company in Distress

Assets	BV	MV	Liabilities	BV	MV
Cash	$200	$200	LT bonds	$300	$200
Fixed Asset	$400	$0	Equity	$300	$0
Total	$600	$200	Total	$600	$200

What happens if the firm is liquidated today?

Selfish Strategy 1: Take Risks

The Gamble	Probability	Payoff
Win Big	10%	$1,000
Lose Big	90%	$0

Cost of investment is $200 (all the firm's cash)

Required return is 50%

Expected CF from the Gamble = $1000 × 0.10 + $0 = $100

$$NPV = -\$200 + \frac{\$100}{(1.50)}$$

$$NPV = -\$133$$

Selfish Strategy 1: Take Risks

- Expected CF from the Gamble
  - To Bondholders = $300 × 0.10 + $0 = $30
  - To Stockholders = ($1000 – $300) × 0.10 + $0 = $70
- PV of Bonds Without the Gamble = $200
- PV of Stocks Without the Gamble = $0

- PV of Bonds With the Gamble: $\$20 = \frac{\$30}{(1.50)}$
- PV of Stocks With the Gamble: $\$47 = \frac{\$70}{(1.50)}$

Selfish Strategy 2: Underinvestment

- Consider a government-sponsored project that guarantees $350 in one period.
- Cost of investment is $300 (the firm only has $200 now), so the stockholders will have to supply an additional $100 to finance the project.
- Required return is 10%.

$$NPV = -\$300 + \frac{\$350}{(1.10)}$$

$$NPV = \$18.18$$

- Should we accept or reject?

Selfish Strategy 2: Underinvestment

Expected CF from the government sponsored project:

To Bondholder = $300

To Stockholder = ($350 – $300) = $50

PV of Bonds Without the Project = $200

PV of Stocks Without the Project = $0

PV of Bonds With the Project: $\$272.73 = \frac{\$300}{(1.10)}$

PV of Stocks With the Project: $-\$54.55 = \frac{\$50}{(1.10)} - \$100$

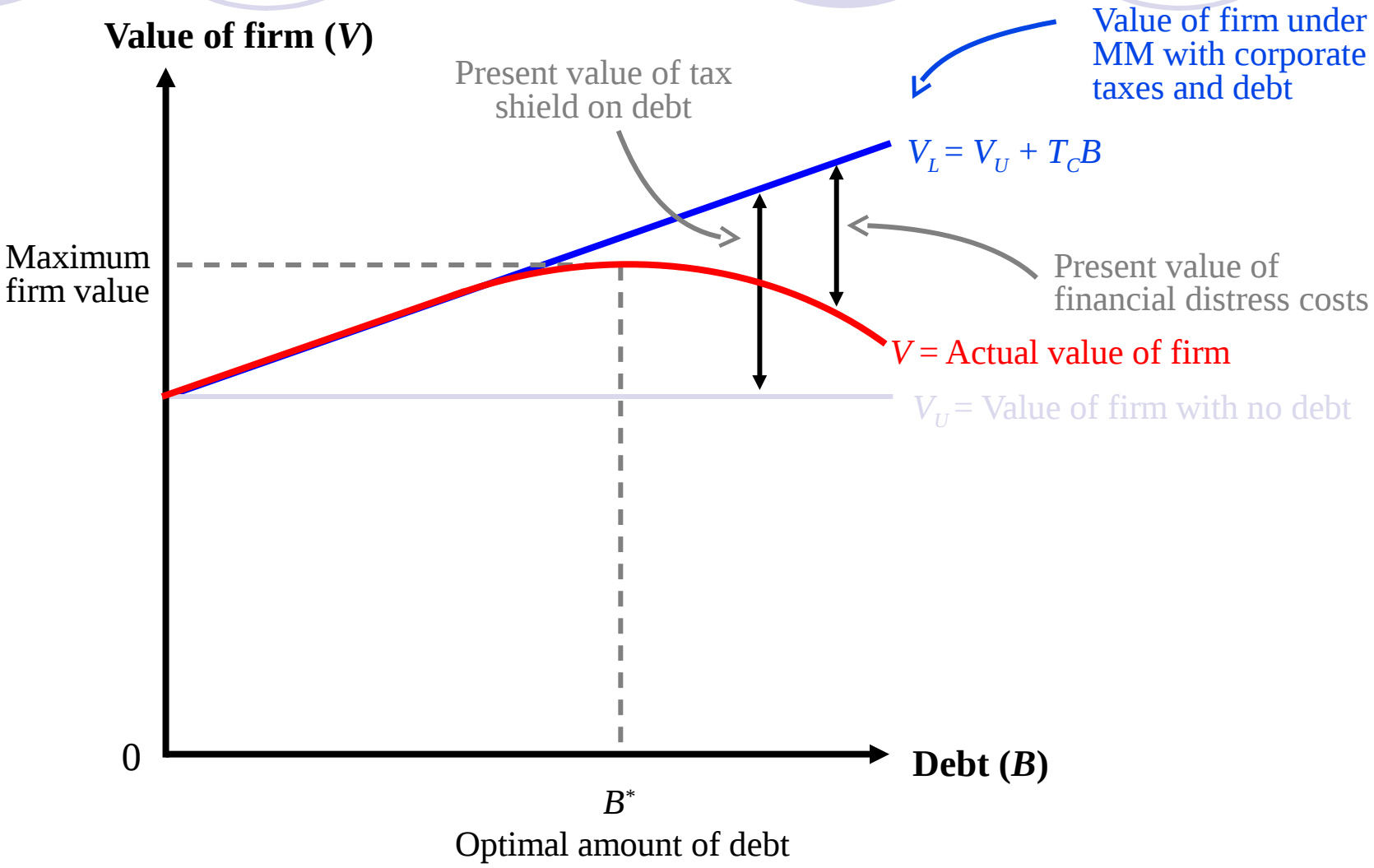
Selfish Strategy 3: Milking the Property

- Liquidating dividends
  - Suppose our firm paid out a $200 dividend to the shareholders. This leaves the firm insolvent, with nothing for the bondholders, but plenty for the former shareholders.
  - Such tactics often violate bond indentures.

17.4 Tax Effects and Financial Distress

- There is a trade-off between the tax advantage of debt and the costs of financial distress.
- It is difficult to express this with a precise and rigorous formula.

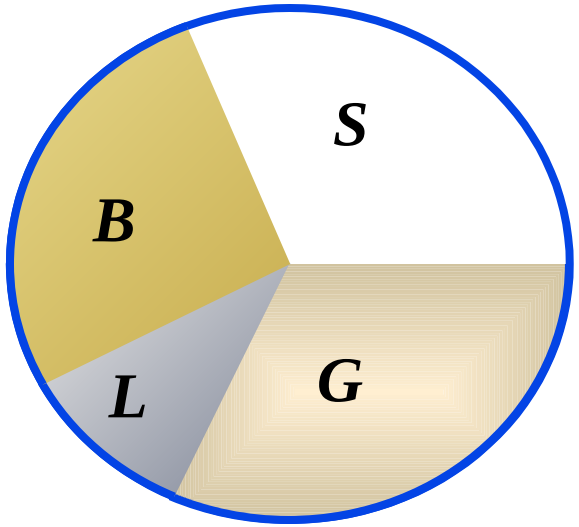
Tax Effects and Financial Distress



The Pie Model Revisited

- Taxes and bankruptcy costs can be viewed as just another claim on the cash flows of the firm.
- Let *G* and *L* stand for payments to the government and bankruptcy lawyers, respectively.
- $V_T = S + B + G + L$

The essence of the M&M intuition is that VT depends on the cash flow of the firm; capital structure just slices the pie.



- Cash Flow = Payments to stockholders (S) + Payments to creditors (B) + Payments to the government (G) + Payments to bankruptcy courts and lawyers (L)

The Pie Model Revisited

- Marketed claims – claims against cash flow that can be bought and sold (bonds, stock)
  VM = value of marketed claims
- Nonmarketed claims – claims against cash flow that cannot be bought and sold (taxes, legal costs)
  VN = value of nonmarketed claims
- VT = value of all claims = VM + VN = S + B + G + L
- Given the firm's cash flows, the optimal capital structure is the one that maximizes VM or minimizes VN.

Sun Importers has a current EBIT of $147,000. The firm has one debt issue outstanding with a market value of $650,000 and a cost of 9%. Assume there are no taxes. Also assume the required return on equity is equal to the required return on debt. The growth rate of the firm is 4% annually in perpetuity.

What is the value of the equity?

What is the total marketable value of the firm?

$EBIT_{Next\ Year} = \$147,000(1.04) = \$152,880$

Cash flow to bondholders = .09($650,000) = $ 58,500

Cash flow to shareholders = $152,880 - $58,500 = $ 94,380

$$V_S = \frac{\$94,380}{.09 - .04} = \$1,887,600$$

$$\begin{aligned} V_M &= V_B + V_S \\ &= \$650,000 + \$1,887,600 \\ &= \$2,537,600 \end{aligned}$$

The Wheat Mill has an all-equity value of $23.6 million. However, the firm is levered as it has $7.9 million of debt outstanding which is currently selling at par. There are 450,000 shares of stock outstanding with a market price of $38.50 a share. The tax rate is 35%.

What is the value of the nonmarketable claims?

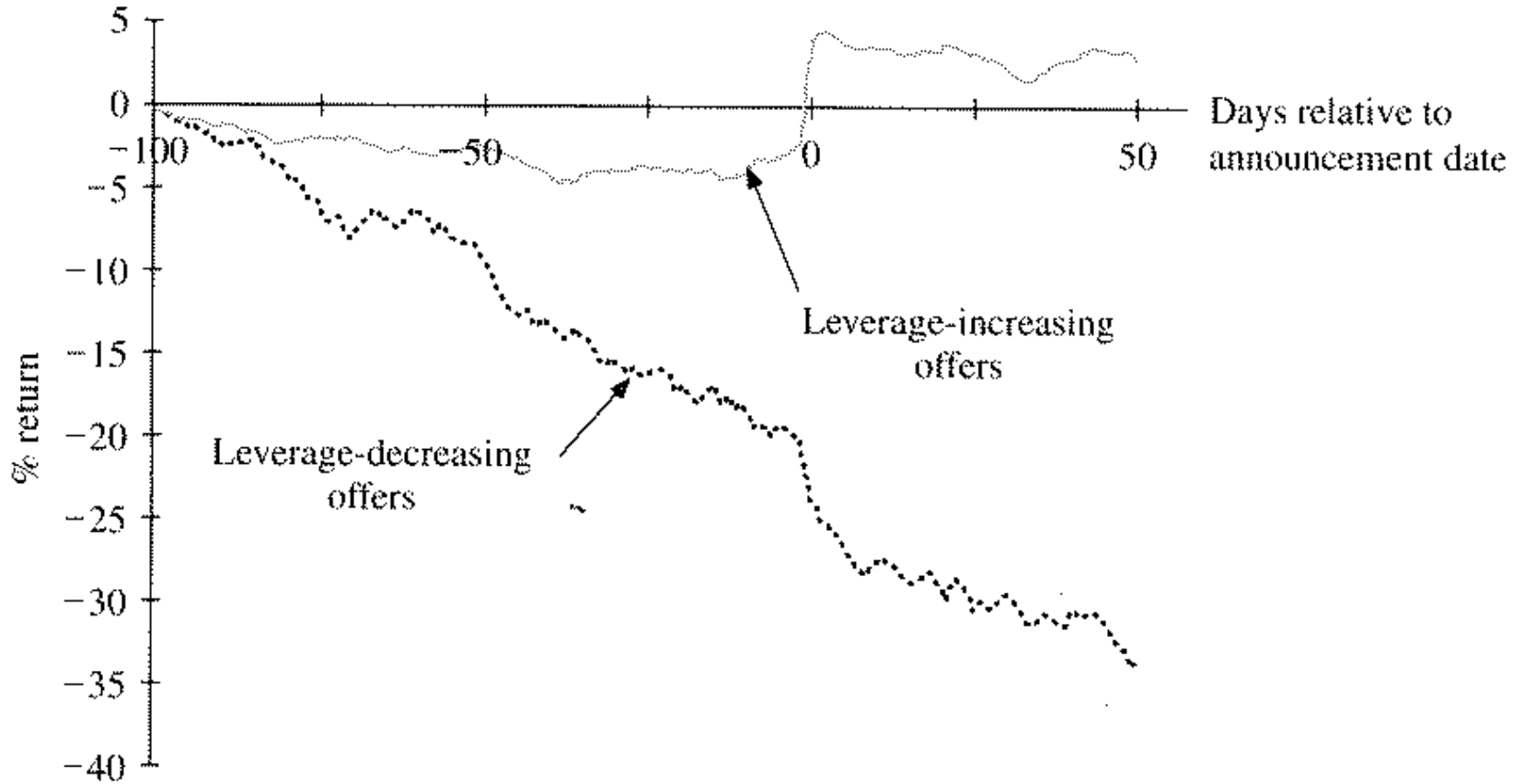
$$V_L = V_U + t_c B$$
$$= \$23{,}600{,}000 + .35(\$7{,}900{,}000)$$
$$= \$26{,}365{,}000$$

$$V_M = B + S$$
$$= \$7{,}900{,}000 + 450{,}000(\$38.50)$$
$$= \$25{,}225{,}000$$

$$V_T = V_M + V_N$$
$$\$26{,}365{,}000 = \$25{,}225{,}000 + V_N$$
$$V_N = \$1{,}140{,}000$$

17.5 Signaling

- Investors view debt as a signal of firm value.
  - Firms with low anticipated profits will take on a low level of debt.
  - Firms with high anticipated profits will take on a high level of debt.



Exchange offers change the debt–equity ratios of firms. The graph shows that stock prices increase for firms whose exchange offers increase leverage. Conversely, stock prices decrease for firms whose offers decrease leverage.

17.6 Agency Cost of Equity

- Greater free cash flow increases agency costs.
  - The *free cash flow hypothesis* says that an increase in dividends should benefit the stockholders by reducing the ability of managers to pursue wasteful activities.
  - The *free cash flow hypothesis* also argues that an increase in debt will reduce the ability of managers to pursue wasteful activities more effectively than dividend increases.
- An individual will work harder for a firm if he is one of the owners than if he is one of the “hired help.”

You currently own 100% of your firm which is valued at $1.4 million. You are planning on doubling the size of the firm next year but are trying to determine whether you should issue debt or equity to raise the additional $1.4 million of capital that is needed.

You have determined that the expanded firm will generate an annual cash flow of $530,000 if you devote 70% of your energy to the firm. On the other hand, if you devote 100% of your energy to the firm, the firm's cash flows would increase to $900,000. The interest rate on the debt is 10%. There are no taxes.

Should you issue debt or equity to fund the expansion?

Should you devote 70% or 100% of your energy to the firm?

Debt Issue				
	Cash Flow	Interest	Cash Flow To Equity	Cash Flow To You
70% effort	$530,000	$140,000	$390,000	$390,000
100% effort	$900,000	$140,000	$760,000	$760,000

Equity Issue				
	Cash Flow	Interest	Cash Flow To Equity	Cash Flow To You
70% effort	$ 530,000	$0	$ 530,000	$265,000
100% effort	$900,000	$0	$900,000	$450,000

17.7 The Pecking-Order Theory

- Theory stating that firms prefer to issue debt rather than equity if internal financing is insufficient.
  - Rule 1
    - Use internal financing first.
  - Rule 2
    - Issue debt next, new equity last.
- The pecking-order theory is at odds with the tradeoff theory:
  - There is no target D/E ratio.
  - Profitable firms use less debt.
  - Companies like financial slack.

17.9 Personal Taxes

- Individuals, in addition to the corporation, must pay taxes. Thus, personal taxes must be considered in determining the optimal capital structure.

Personal Taxes

- Dividends face double taxation (firm and shareholder), which suggests a stockholder receives the net amount:
  - $(1-T_C) \times (1-T_S)$
- Interest payments are only taxed at the individual level since they are tax deductible by the corporation, so the bondholder receives:
  - $(1-T_B)$

Personal Taxes

- If $T_S = T_B$ then the firm should be financed primarily by debt (avoiding double tax).
- The firm is indifferent between debt and equity when:

$$(1-T_C) \times (1-T_S) = (1-T_B)$$

17.10 How Firms Establish Capital Structure

- Most corporations have low Debt-Asset ratios.
- Changes in financial leverage affect firm value.
  - Stock price increases with leverage and vice-versa; this is consistent with M&M with taxes.
  - Another interpretation is that firms signal good news when they lever up.
- There are differences in capital structure across industries.
- There is evidence that firms behave as if they had a target Debt-Equity ratio.

Reading Assignments

Please read the textbook to understand the following topics

17.2 Description of Financial Distress Costs

- Direct Costs
  - Legal and administrative costs
- Indirect Costs
  - Impaired ability to conduct business (e.g., lost sales)

17.3 Can Costs of Debt Be Reduced?

- Protective Covenants
- Debt Consolidation:
  - If we minimize the number of parties, contracting costs fall.

Factors in Target D/E Ratio

- Taxes
  - Since interest is tax deductible, highly profitable firms should use more debt (i.e., greater tax benefit).
- Financial distress – the lower the risk (or cost) of distress, the more likely a firm is to borrow funds
  - This is affected by:
  - -the types of assets (tangible vs. intangible)
  - -uncertainty of operating income
- Pecking Order and Financial Slack Pecking Order and Financial Slack
  - Theory stating that firms prefer to issue debt rather than equity if internal financing is insufficient.

Chapter 18

Valuation and Capital Budgeting for the Levered Firm

Key Concepts and Skills

- Understand the effects of leverage on the value created by a project
- Be able to apply Adjusted Present Value (APV), the Flows to Equity (FTE) approach, and the WACC method for valuing projects with leverage

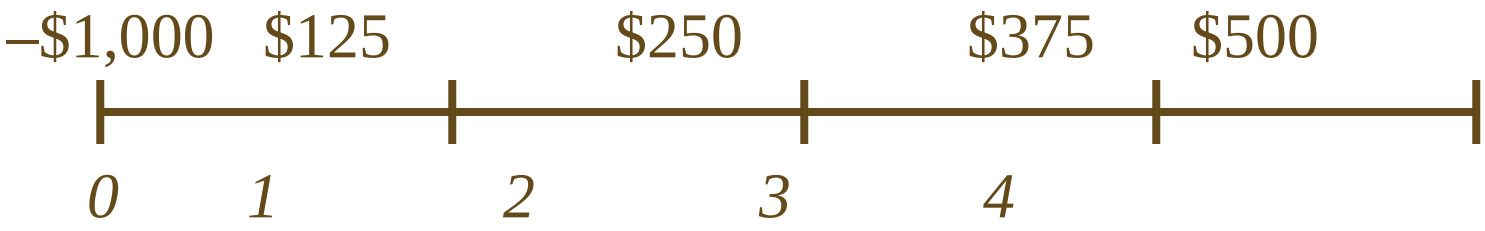
18.1 Adjusted Present Value Approach

$$APV = NPV + NPVF$$

- The value of a project to the firm can be thought of as the value of the project to an unlevered firm (*NPV*) plus the present value of the financing side effects (*NPVF*).
- There are four side effects of financing:
  - The Tax Subsidy to Debt
  - The Costs of Issuing New Securities
  - The Costs of Financial Distress
  - Subsidies to Debt Financing

APV Example

Consider a project of the Pearson Company. The timing and size of the incremental after-tax cash flows for an all-equity firm are:



The unlevered cost of equity is $R_0 = 10\%$:

$$NPV_{10\%} = -\$1{,}000 + \frac{\$125}{(1.10)} + \frac{\$250}{(1.10)^2} + \frac{\$375}{(1.10)^3} + \frac{\$500}{(1.10)^4}$$

$$NPV_{10\%} = -\$56.50$$

The project would be rejected by an all-equity firm: $NPV < 0$.

APV Example

- Now, imagine that the firm finances the project with \$600 of debt at R_B = 8%.
- Pearson's tax rate is 40%, so they have an interest tax shield worth $t_C B R_B$ = .40×\$600×.08 = \$19.20 each year.

- The net present value of the project under leverage is:

$$APV = NPV + NPV_{\text{debt tax shield}}$$

$$APV = -\$56.50 + \sum_{t=1}^{4} \frac{\$19.20}{(1.08)^t}$$

$$APV = -\$56.50 + 63.59 = \$7.09$$

- So, Pearson should accept the project *with debt*.

18.2 Flow to Equity Approach

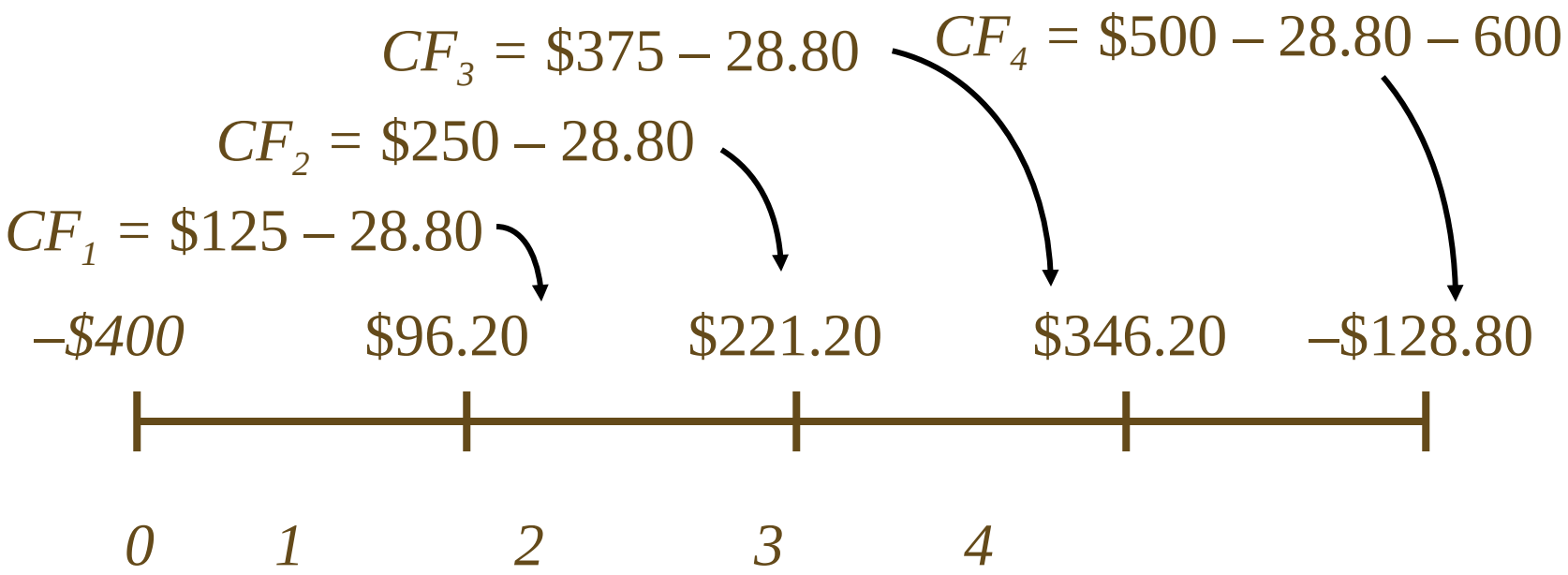
- Discount the cash flow from the project to the equity holders of the levered firm at the cost of levered equity capital, R_S.
- There are three steps in the FTE Approach:
  - Step One: Calculate the levered cash flows (LCFs)
  - Step Two: Calculate R_S.
  - Step Three: Value the levered cash flows at R_S.

Step One: Levered Cash Flows

- Since the firm is using $600 of debt, the equity holders only have to provide $400 of the initial $1,000 investment.
- Thus, CF_0 = –$400
- Each period, the equity holders must pay interest expense. The after-tax cost of the interest is:

$$B \times R_B \times (1 - t_C) = \$600 \times .08 \times (1 - .40) = \$28.80$$

Step One: Levered Cash Flows



Step Two: Calculate R_S

$$R_S = R_0 + \frac{B}{S}(1 - t_C)(R_0 - R_B)$$

To calculate the debt to equity ratio, $\frac{B}{S}$, start with $\frac{B}{V}$

$$PV = \frac{\$125}{(1.10)} + \frac{\$250}{(1.10)^2} + \frac{\$375}{(1.10)^3} + \frac{\$500}{(1.10)^4} + \sum_{t=1}^{4} \frac{19.20}{(1.08)^t}$$

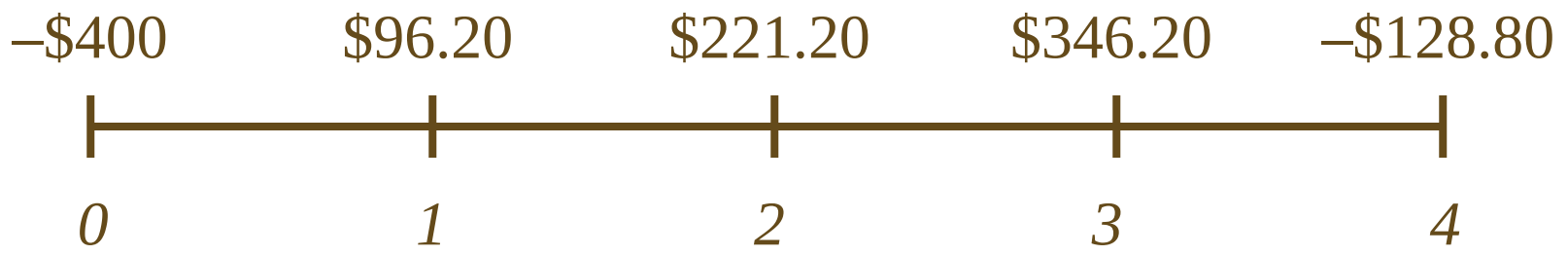
$PV = \$943.50 + \$63.59 = \$1{,}007.09$

$B = \$600$ when $V = \$1{,}007.09$ so $S = \$407.09$.

$$R_S = .10 + \frac{\$600}{\$407.09}(1 - .40)(.10 - .08) = 11.77\%$$

Step Three: Valuation

- Discount the cash flows to equity holders at R_s = 11.77%



$$NPV = -\$400 + \frac{\$96.20}{(1.1177)} + \frac{\$221.20}{(1.1177)^2} + \frac{\$346.20}{(1.1177)^3} - \frac{\$128.80}{(1.1177)^4}$$

$$NPV = \$28.56$$

18.3 WACC Method

$$R_{WACC} = \frac{S}{S+B} R_S + \frac{B}{S+B} R_B (1 - t_C)$$

- To find the value of the project, discount the unlevered cash flows at the weighted average cost of capital.
- Suppose Pearson's target debt to equity ratio is 1.50 (=600/407.09)

WACC Method

$$1.5 = \frac{B}{S} \qquad \therefore 1.5S = B$$

$$\frac{B}{S+B} = \frac{1.5S}{S+1.5S} = \frac{1.5}{2.5} = 0.60 \qquad \frac{S}{S+B} = 1 - 0.60 = 0.40$$

$$R_{WACC} = (0.40) \times (11.77\%) + (0.60) \times (8\%) \times (1 - .40)$$

$$R_{WACC} = 7.58\%$$

WACC Method

- To find the value of the project, discount the unlevered cash flows at the weighted average cost of capital

$$NPV = -\$1{,}000 + \frac{\$125}{(1.0758)} + \frac{\$250}{(1.0758)^2} + \frac{\$375}{(1.0758)^3} + \frac{\$500}{(1.0758)^4}$$

$$NPV_{7.58\%} = \$6.68$$

18.4 A Comparison of the APV, FTE, and WACC Approaches

- All three approaches attempt the same task: valuation in the presence of debt financing.

Which approach is best?

- Use *APV* when the *level* of debt is constant
- Use *WACC* and *FTE* when the debt *ratio* is constant
  - *WACC* is by far the most common
  - *FTE* is a reasonable choice for a highly levered firm

Summary: APV, FTE, and WACC

	APV	FTE	WACC
Initial Investment (all or equity portion)			
Cash Flows (UCF or LCF)			
Discount Rates (R_0 *or* R_{WACC} *or* R_S)			
Whether measure PV of financing effects			

18.5 Capital Budgeting When the Discount Rate Must Be Estimated

- A *scale-enhancing* project is one where the project is similar to those of the existing firm.
- In the real world, executives would make the assumption that the business risk of the non-scale-enhancing project would be about equal to the business risk of firms already in the business.
- No exact formula exists for this. Some executives might select a discount rate slightly higher on the assumption that the new project is somewhat riskier since it is a new entrant.

18.5 Capital Budgeting When the Discount Rate Must Be Estimated

XY, Inc. plans to expand its manufacturing facilities and start producing a new type of artificial stone for outdoor patios. The project will have a debt-to-equity ratio of .40 and a pre-tax cost of debt of 8%. ABC, the sole firm producing this product now, has a pre-tax cost of debt of 7.5%, a debt-to-value ratio of .20, and a beta of 1.4. Both firms have a 35% tax rate. The risk-free rate of return is 4.5% and the market rate of return is 12%.

What is ABC's cost of equity capital?

What is the hypothetical all-equity cost of capital?

What is XY's cost of equity capital?

What is XY's weighted average cost of capital?

18.5 Capital Budgeting When the Discount Rate Must Be Estimated

ABC's cost of equity capital:

$$\begin{aligned} R_S &= R_F + \beta \times (\bar{R}_M - R_F) \\ &= .045 + 1.4(.12 - .045) \\ &= .1500 \\ &= 15\% \end{aligned}$$

Hypothetical all-equity cost of capital:

$$R_S = R_0 + \frac{B}{S}(1 - t_c)(R_0 - R_B)$$

$$.15 = R_0 + \frac{.20}{1 - .20}(1 - .35)(R_0 - .075)$$

$$.15 = R_0 + .1625R_0 - .0121875$$

$$.1621875 = 1.1625R_0$$

$$R_0 = .139516$$

$$R_0 = 13.95\%$$

18.5 Capital Budgeting When the Discount Rate Must Be Estimated

XY's cost of equity capital:

$$R_S = R_0 + \frac{B}{S}(1 - t_c)(R_0 - R_B)$$

$$R_S = .1395 + \frac{.40}{1}(1 - .35)(.1395 - .08)$$

$$R_S = .1395 + .01547$$

$$R_S = .15497$$

$$R_S = 15.50\%$$

XY's weighted average cost of capital:

$$R_{WACC} = \frac{B}{S+B}R_B(1 - t_c) + \frac{S}{S+B}R_S$$

$$= \frac{.4}{1.4}(.08)(1 - .35) + \frac{1}{1.4}(.155)$$

$$= .01486 + .11071$$

$$= .12557$$

$$= 12.56\%$$

Beta and Leverage: No Corporate Taxes

- Recall that, in a world without corporate taxes, and with **riskless** corporate debt ($\beta_{Debt} = 0$), it can be shown that the relationship between the beta of the unlevered firm and the beta of levered equity is:

$$\beta_{Asset} = \frac{Equity}{Asset} \times \beta_{Equity}$$

- In a world without corporate taxes, and with **risky** corporate debt, it can be shown that the relationship between the beta of the unlevered firm and the beta of levered equity is:

$$\beta_{Asset} = \frac{Debt}{Asset} \times \beta_{Debt} + \frac{Equity}{Asset} \times \beta_{Equity}$$

Beta and Leverage: With Corporate Taxes

- In a world with corporate taxes, and riskless debt, it can be shown that the relationship between the beta of the unlevered firm and the beta of levered equity is:

$$\beta_{\text{Equity}} = \left[1 + \frac{\text{Debt}}{\text{Equity}} \times (1 - t_C)\right] \beta_{\text{Unleveredfirm}}$$

- Since $\left[1 + \frac{\text{Debt}}{\text{Equity}} \times (1 - t_C)\right]$ must be more than 1 for a levered firm, it follows that $\beta_{\text{Equity}} > \beta_{\text{Unlevered firm}}$

Beta and Leverage: With Corporate Taxes

- If the beta of the debt is non-zero, then:

$$\beta_{\text{Equity}} = \beta_{\text{Unleveredfirm}} + (1 - t_C)(\beta_{\text{Unleveredfirm}} - \beta_{\text{Debt}}) \times \frac{B}{S_L}$$

Beta and Leverage

- Company A is considering expanding its operations. Currently, the market value of the firm's equity is $116 million while the market value of debt is $72 million. The equity has a beat of 1.8 and the debt is riskless. The risk free rate is 5.5%. The expected return on the market is 13.7% and the tax rate is 34%.
- What is the beta of a hypothetical all-equity firm given the information on Company A? Given that beta, what discount rate should be applied to the expansion project?

Beta and Leverage

$$B_{\text{Unlevered firm}} = \frac{\text{Equity}}{\text{Equity} + (1 - t_c) \times \text{Debt}} \times B_{\text{Equity}}$$

$$= \frac{\$116 \text{ million}}{\$116 \text{ million} + (1 - .34) \times \$72 \text{ million}} \times 1.8$$

$$= \frac{\$116 \text{ million}}{\$163.52 \text{ million}} \times 1.8$$

$$= 1.28$$

$$R_S = R_F + \beta \times [R_M - R_F]$$

$$= .055 + 1.28 \times (.137 - .055)$$

$$= .15996$$

$$= 16.00\%$$

Summary

1. The APV formula can be written as:

$$APV = \sum_{t=1}^{\infty} \frac{UCF_t}{(1+R_0)^t} + \begin{matrix}\text{Additional}\\ \text{effects of}\\ \text{debt}\end{matrix} - \begin{matrix}\text{Initial}\\ \text{investment}\end{matrix}$$

2. The FTE formula can be written as:

$$FTE = \sum_{t=1}^{\infty} \frac{LCF_t}{(1+R_S)^t} - \left[\begin{matrix}\text{Initial}\\ \text{investment}\end{matrix} - \begin{matrix}\text{Amount}\\ \text{borrowed}\end{matrix} \right]$$

3. The WACC formula can be written as

$$NPV_{WACC} = \sum_{t=1}^{\infty} \frac{UCF_t}{(1+R_{WACC})^t} - \begin{matrix}\text{Initial}\\ \text{investment}\end{matrix}$$

Summary

4. Use the WACC or FTE if the firm's target debt to value ratio applies to the project over its life.
   - WACC is the most commonly used by far.
   - FTE has appeal for a firm deeply in debt.
5. The APV method is used if the level of debt is known over the project's life.
   - The APV method is frequently used for special situations like interest subsidies, LBOs, and leases.
6. The beta of the equity of the firm is positively related to the leverage of the firm.

Chapter 19
Dividends and Other Payouts

19.1 Different Types of Dividends

- Many companies pay a **regular cash dividend**.
  - Public companies often pay quarterly.
  - Sometimes firms will pay an extra cash dividend.
    - paid over and above the regular dividend, may or may not be repeated
  - The extreme case would be a liquidating dividend.
- Companies will often declare **stock dividends.**
  - No cash leaves the firm.
  - pay owners with additional shares of stock .

19.2 Standard Method of Cash Dividend

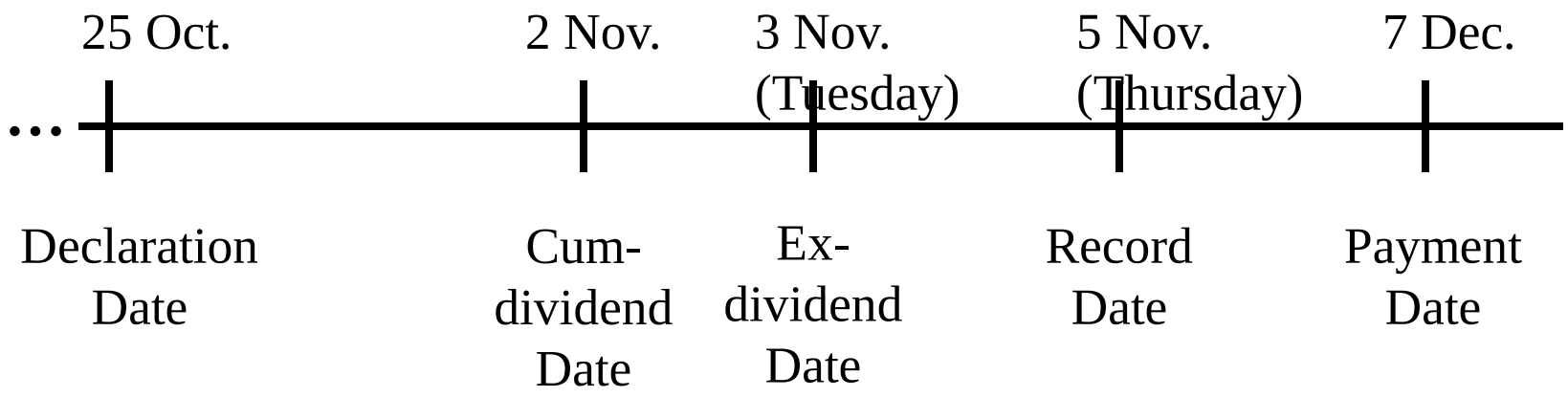
Cash Dividend - Payment of cash by the firm to its shareholders.

Ex-Dividend Date - Date that determines whether a stockholder is entitled to a dividend payment; anyone holding stock immediately before this date is entitled to a dividend.

Record Date – firm prepares the list of stockholders who will receive dividends

.

Procedure for Cash Dividend



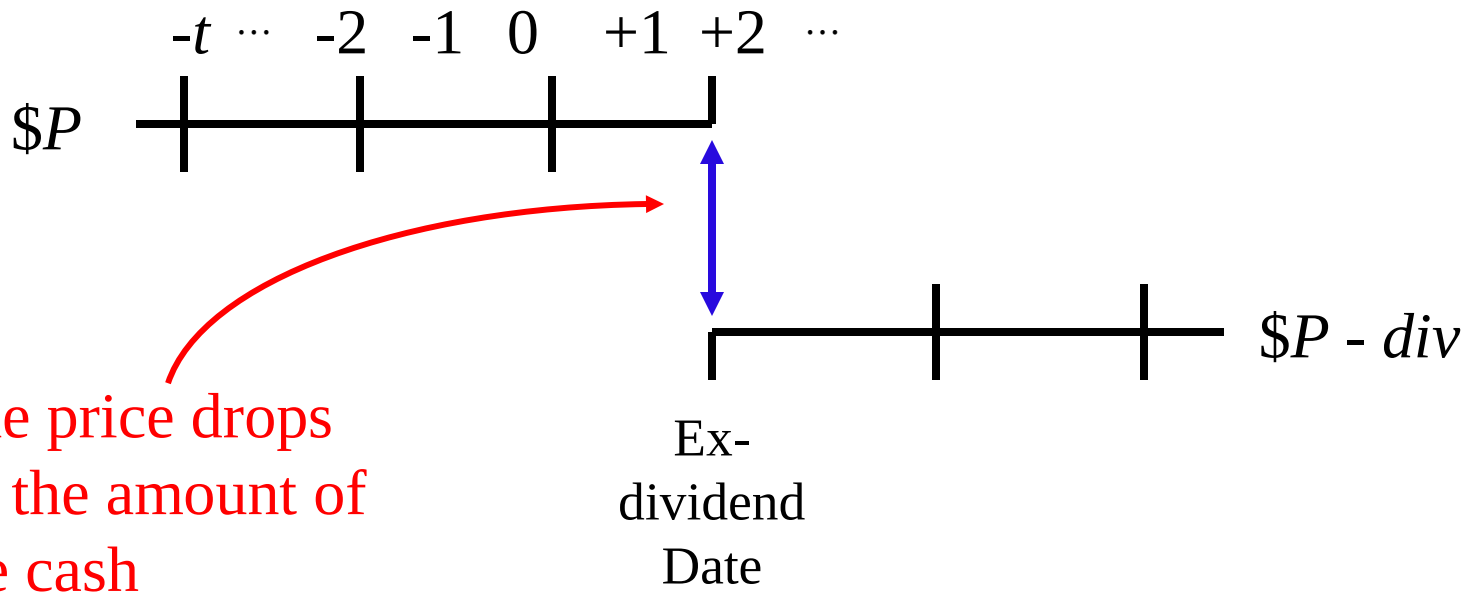
Declaration Date: The Board of Directors declares a payment of dividends.

Ex-Dividend Date: Seller of the stock retains the dividend. It is the 2nd business day before the date of record.

Record Date: The corporation prepares a list of all individuals believed to be stockholders as of 5 November.

Price Behavior

- In a perfect world, the stock price will fall by the amount of the dividend on the ex-dividend date.



Taxes complicate things a bit. Empirically, the price drop is less than the dividend and occurs within the first few minutes of the ex-date.

Residual Dividend Policy

- A firm should focus on meeting its investment needs and maintaining its desired debt-equity ratio. Having done so, a firm pays out any leftover or residual, income as dividends.

Residual Dividends

Phillip's Greenhouses has aftertax earnings of $48,700 for the year. The company maintains a debt-equity ratio of .45 and has a residual dividend policy. $36,000 is needed for new investments.

How much of the aftertax earnings must be kept to help finance the new investments?

How much of the aftertax earnings can be paid out in dividends if the firm only retains that which is necessary for the new investments?

Residual Dividends

	Weight
D =	.45 31%
E =	1.00 69%
A =	1.45 100%

$\$36{,}000 \times .31 = \$11{,}160$ Debt

$\$36{,}000 \times .69 = \$24{,}840$ Equity

$$\text{Dividend} = \$48{,}700 - \$24{,}840 = \$23{,}860$$

19.3 The Irrelevance of Dividend Policy

- Dividend *policy* is irrelevant.
  - Assumptions: The investment policy of the firm is set ahead of time and is not altered by changes in dividend policy.

- In other words, dividend policy will have no impact on the value of the firm because investors can create whatever income stream they prefer by using homemade dividends.

Homemade Dividends

- Bianchi Inc.'s stock price is $42 per share. It is about to pay a $2 cash dividend.
- Bob Investor owns 80 shares and prefers a $3 dividend.
- Bob's homemade dividend strategy:
  - Sell 2 shares ex-dividend

	$3 Dividend	Homemade dividends
Cash from dividend	$240	$160
Cash from selling stock	$0	$80
Total Cash	$240	$240
Value of Stock Holdings	$39 × 80 = $3,120	$40 × 78 = $3,120

Dividend Policy is Irrelevant

- In the above example, Bob Investor began with a total wealth of $3,360:

- After a $3 dividend, his total wealth is still $3,360:

- After a $2 dividend and sale of 2 ex-dividend shares, his total wealth is still $3,360:

Dividends and Investment Policy

- Firms should never forgo positive NPV projects to increase a dividend (or to pay a dividend for the first time).
- Recall that one of the assumptions underlying the dividend-irrelevance argument is: “The investment policy of the firm is set ahead of time and is not altered by changes in dividend policy.”

19.4 Repurchase of Stock

- Instead of declaring cash dividends, firms can rid themselves of excess cash through buying shares of their own stock.
- Recently, share repurchase has become an important way of distributing earnings to shareholders.

Stock Repurchase versus Dividend

Consider a firm that wishes to distribute $100,000 to its shareholders.

A. Original balance sheet

Assets		***Liabilities & Equity***	
Cash	$150,000	Debt	0
Other Assets	850,000	Equity	1,000,000
Value of Firm	1,000,000	Value of Firm	1,000,000

Shares outstanding = 100,000

Price per share = $1,000,000 /100,000 = $10

Stock Repurchase versus Dividend

If they distribute the $100,000 as a cash dividend, the balance sheet will look like this:

Assets ***Liabilities & Equity***

B. After $1 per share cash dividend

Cash	$50,000	Debt	0
Other Assets	850,000	Equity	900,000
Value of Firm	900,000	Value of Firm	900,000

Shares outstanding = 100,000

Price per share = $900,000/100,000 = $9

Stock Repurchase versus Dividend

If they distribute the $100,000 through a stock repurchase, the balance sheet will look like this:

Assets ***Liabilities& Equity***

C. After stock repurchase

Cash	$50,000	Debt	0
Other Assets	850,000	Equity	900,000
Value of Firm	900,000	Value of Firm	900,000

Shares outstanding= 90,000

Price pershare = $900,000 / 90,000 = $10

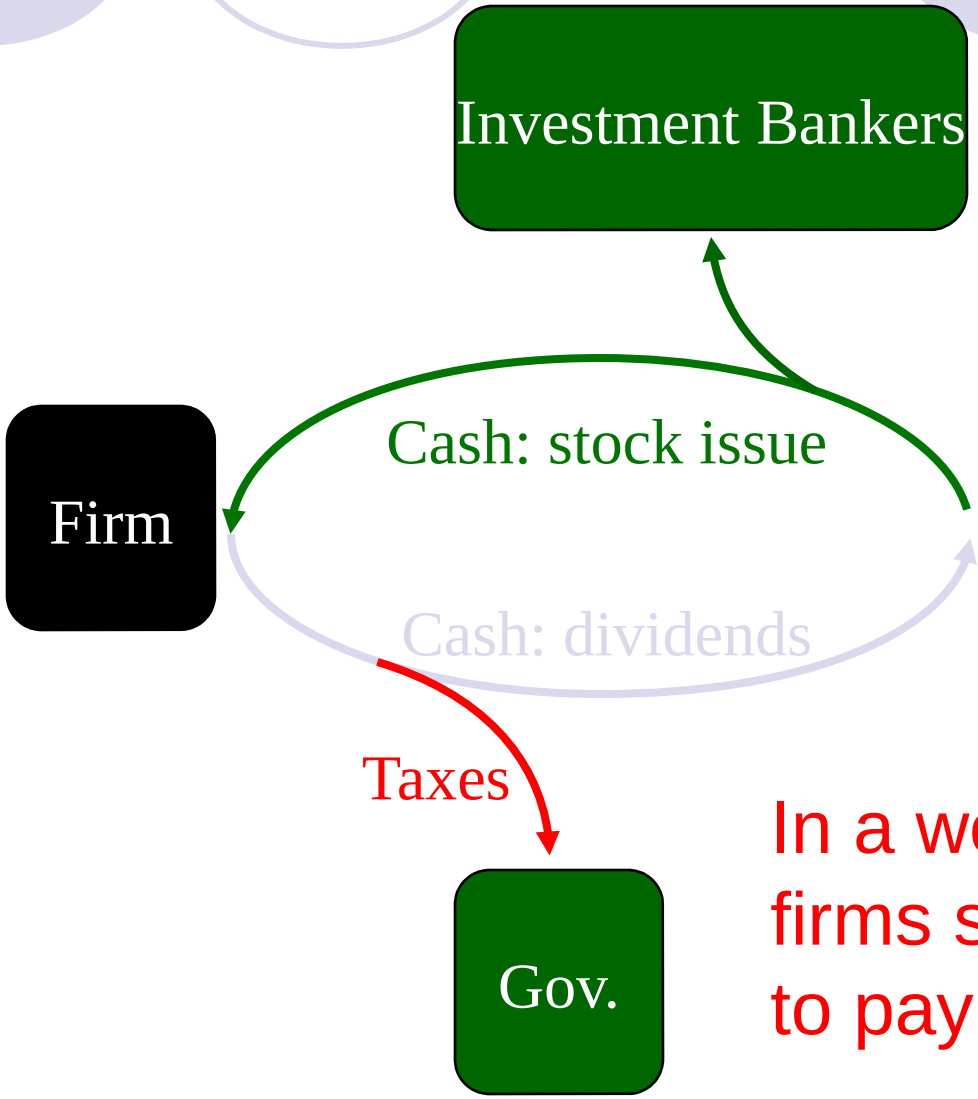
Share Repurchase

- Flexibility for shareholders
- Keeps stock price higher
  - Good for insiders who hold stock options
- As an investment of the firm (undervaluation)
- Tax benefits

19.5 Personal Taxes and Dividends

- To get the result that dividend policy is irrelevant, we needed three assumptions:
  - No taxes
  - No transactions costs
  - No uncertainty
- In the United States, both cash dividends and capital gains are taxed at a maximum rate of 15 percent.
- Since capital gains can be deferred, the tax rate on dividends is greater than the *effective* rate on capital gains.

Firms without Sufficient Cash



The direct costs of stock issuance will add to this effect.

In a world of personal taxes, firms should not issue stock to pay a dividend.

19.6 Real-World Factors Favoring High Dividends

- Desire for Current Income
- Information Content of Dividends and Dividend Signaling
- Agency Costs
  - High dividends reduce free cash flow.
- Taxes
  - A corporate stockholder is granted a 70% (or more) dividend exclusion.
  - Tax-exempt investors.

19.6 Real-World Factors Favoring Low Dividends

- Individuals in upper income tax brackets might prefer lower dividend payouts, given the immediate tax liability, in favor of higher capital gains with the deferred tax liability
- Flotation costs – low payouts can decrease the amount of capital that needs to be raised, thereby lowering flotation costs
- Dividend restrictions – debt contracts might limit the percentage of income that can be paid out as dividends

19.7 The Clientele Effect

- Investors that prefer high payouts will invest in firms that have high payouts, and investors that prefer low payouts will invest in firms with low payouts.
- If a firm changes its payout policy, it will not affect the stock value; it will just end up with a different set of investors.
- This is true as long as the “market” for dividend policy is in equilibrium.

19.8 What We Know and Do Not Know

A Sensible Payout Policy

- In practice, managers tend to have the following goals, in order of importance:
  - avoid cutting back on positive NPV projects to pay a dividend
  - avoid dividend cuts
  - avoid the need to sell equity
  - maintain a target debt-to-equity ratio
  - maintain a target dividend payout ratio

19.8 What We Know and Do Not Know

- Some Survey Evidence about Dividends
  - Almost 94% of the managers that responded to the survey indicated that they try to avoid reducing the dividends per share.
  - About 84% of the managers indicate that they try to maintain consistency with historic dividends.
  - Less than 10% of managers worry about flotation costs.

19.9 Stock Dividends

- Pay additional shares of stock instead of cash
- Increases the number of outstanding shares
- Small stock dividend
  - Less than 20 to 25%
  - If you own 100 shares and the company declared a 10% stock dividend, you would receive an additional 10 shares.
- Large stock dividend – more than 20 to 25%

Stock Splits

- Stock splits – essentially the same as a stock dividend except it is expressed as a ratio
  - For example, a 2 for 1 stock split is the same as a 100% stock dividend.
- Stock price is reduced when the stock splits.
- Common explanation for split is to return price to a “more desirable trading range.”

Shareholder position

Faith owns 900 shares of INJ, Inc. The shares closed today at a market price of $1.10 a share. Tomorrow, a 1-for-20 reverse stock split takes effect. Ignore taxes.

How many shares will Faith own tomorrow morning when the market opens?

All else equal, what will the opening price per share be?

Shareholder position

$$\text{Number of shares} = 900 \times 1/20$$
$$= 45$$

$$\text{Opening price per share} = \$1.10 \times 20/1$$
$$= \$22.00$$

$$\text{Old shares} \times \text{Old price} = \text{New shares} \times \text{New price}$$
$$900 \times \$1.10 = 45 \times \$22.00$$
$$\$990 = \$990$$

Chapter 20
Issuing Securities to the Public

20.1 The Public Issue

- The Basic Procedure
  - Management gets the approval of the Board.
  - The firm prepares and files a *registration statement* with the SEC.
  - The SEC studies the registration statement during the *waiting period.*
  - The firm prepares and files an *amended* registration statement with the SEC.
  - If everything is fine with the SEC, a price is set and a full-fledged selling effort gets underway.

20.2 Alternative Issue Methods

- There are two kinds of public issues:
  - The general cash offer
  - The rights offer
- Almost all debt is sold in general cash offerings.

20.3 The Cash Offer

- There are three methods for issuing securities for cash:
  - Firm Commitment
  - Best Efforts
  - Dutch Auction

Firm Commitment Underwriting

- The issuing firm sells the entire issue to the underwriting syndicate.
- The syndicate then resells the issue to the public.
- The underwriter makes money on the spread between the price paid to the issuer and the price received from investors when the stock is sold.
- The syndicate bears the risk of not being able to sell the entire issue for more than the cost.
- This is the most common type of underwriting in the United States.

Microsoft's IPO

- In December, 1985, MSFT selected their underwriters: Goldman Sachs and Alex. Brown
- On 2/3/1986, MSFT filed their preliminary prospectus with the SEC, citing a price range of $16-$19.
- Over the Feb. 18-27 period, MSFT (including Gates) and investment banks undertook a road show, presenting to investors in 8 cities.
  - The month of Feb. was a very good one for the market. The Dow rose from 1571 to 1709 (8.8%)
- On 3/10/1986, Revised the price range to $20-$22
- MSFT's IPO took place on 3/13/1986 with offer price of $21. MSFT opened at $25.75 and closed at $27.75.

Best Efforts Underwriting

- Underwriter must make their “best effort” to sell the securities at an agreed-upon offering price.
- The company bears the risk of the issue not being sold.
- The offer may be pulled if there is not enough interest at the offer price. The company does not get the capital, and they have still incurred substantial flotation costs.
- This type of underwriting is not as common as it used to be.

Dutch Auction Underwriting

- Underwriter accepts a series of bids that include number of shares and price per share.
- The price that everyone pays is the highest price that will result in all shares being sold.
- There is an incentive to bid high to make sure you get in on the auction but knowing that you will probably pay a lower price than you bid.
- The Treasury has used Dutch auctions for years.
- Google was the first large Dutch auction IPO.

IPO Dutch Auctions Vs. Traditional Allocation (Website)

- http://www.forbes.com/2004/05/10/cx_aw_0510mondaymatchup.html

- http://www.fool.com/investing/general/2004/05/26/going-dutch-with-google.aspx

Google’s IPO

- In October 2003, while discussing a possible initial public offering of shares (IPO), Microsoft approached the company about a possible partnership or merger.
- In January 2004, Google announced the hiring of Morgan Stanley and Goldman Sachs Group to arrange an IPO. The IPO was projected to raise as much as $4 billion.
- On April 29, 2004, Google made an S-1 form SEC filing for an IPO to raise as much as $2,718,281,828. This alludes to Google's corporate culture with a touch of mathematical humor as e ≈ 2.718281828.
- In May 2004, Google officially cut Goldman Sachs from the IPO, leaving Morgan Stanley and Credit Suisse First Boston as the joint underwriters. They chose the unconventional way of allocating the initial offering through an auction (specifically, a "Dutch auction"), so that "anyone" would be able to participate in the offering.
- The smallest required account balances at most authorized online brokers that are allowed to participate in an IPO, however, are around $100,000.
- The initial offering of shares was sold for $85 a piece. The public valued it at $100.34 at the close of the first day of trading, which saw 22,351,900 shares change hands.
- Google's initial public offering took place on August 19, 2004. A total of 19,605,052 shares were offered at a price of $85 per share. The sale raised US$1.67 billion, and gave Google a market capitalization of more than $23 billion. The vast majority of Google's 271 million shares remained under Google's control. Many of Google's employees became instant paper millionaires. Yahoo!, a competitor of Google, also benefited from the IPO because it owns 2.7 million shares of Google.
- The company is listed on the NASDAQ stock exchange under the ticker symbol **GOOG**.

IPO Underpricing

- May be difficult to price an IPO because there is not a current market price available.
- Private companies tend to have more asymmetric information than companies that are already publicly traded.
- Underwriters want to ensure that, on average, their clients earn a good return on IPOs.
- Underpricing causes the issuer to “leave money on the table.”

Firm name	IPO date	Offer price	Closing price	initial return	shares (Mil)	$ (Mil)
OfficeMax	11/2/94	$19.00	$24.50	28.95%	26.5	145.8
Polo Ralph Lauren*	6/11/97	$26.00	$31.50	21.15%	23.5	129.3
Ticketmaster Online	12/2/98	$14.00	$40.25	187.50%	7.0	183.8
Priceline.com	3/30/99	$16.00	$69.00	331.25%	10.0	530.0
Goldman Sachs*	5/4/99	$53.00	$70.38	32.78%	55.2	959.1
eToys	5/20/99	$20.00	$76.56	282.81%	8.3	470.6
Drugstore.com	7/28/99	$18.00	$50.25	179.17%	5.0	161.3
UPS*	11/10/99	$50.00	$68.25	36.50%	87.5	1597.2
Buy.com	2/8/00	$13.00	$25.12	93.23%	14.0	169.7
Palm	3/2/00	$38.00	$95.06	150.16%	23.0	1312.4
Google	8/19/04	$85.00	$100.33	18.04%	19.6	300.5
Tim Horton’s	3/23/06	$23.16	$28.17	21.63%	29.0	145.2
Visa	3/19/08	$44.00	$56.50	28.41%	406.0	5075.0

20.4 The Announcement of New Equity and the Value of the Firm

- The market value of *existing* equity drops on the announcement of a new issue of common stock.
- Reasons include
  - Managerial Information

    Since the managers are the insiders, perhaps they are selling new stock because they think it is overpriced.
  - Debt Capacity

    If the market infers that the managers are issuing new equity to reduce their debt-equity ratio due to the specter of financial distress, the stock price will fall.
  - Falling Earnings

20.5 The Cost of New Issues

- Spread or underwriting discount
- Other direct expenses
- Indirect expenses
  - Abnormal returns
  - Underpricing
- Green Shoe Option

The Costs of Equity Public Offerings

Proceeds (in millions)	Direct Costs Underpricing SEOs	IPOs	IPOs
2 - 9.99	2.88%	15.36%	18.18%
10 - 19.99	8.81%	11.63%	10.02%
20 - 39.99	7.24%	9.81%	17.91%
40 - 59.99	6.20%	9.21%	29.57%
60 - 79.99	5.81%	8.65%	39.20%
80 - 99.99	5.56%	8.34%	45.36%
100 - 199.99	5.00%	7.67%	37.10%
200 - 499.99	4.26%	6.72%	17.72%
500 and up	3.64%	5.15%	12.19%

20.6 Rights

- *If* a preemptive right is contained in the firm's articles of incorporation, the firm must offer any new issue of common stock first to existing shareholders.
- This allows shareholders to maintain their percentage ownership if they so desire.

Mechanics of Rights Offerings

- The management of the firm must decide:
  - The exercise price (the price existing shareholders must pay for new shares).
  - How many rights will be required to purchase one new share of stock.
- These rights have value:
  - Shareholders can either exercise their rights or sell their rights.

Rights Offering Example

- Popular Delusions, Inc. is proposing a rights offering. There are 200,000 shares outstanding trading at $25 each. There will be 10,000 new shares issued at a $20 subscription price.
- What is the new market value of the firm?
- What is the ex-rights price?
- What is the value of a right?

What is the new market value of the firm?

$$\$5{,}200{,}000 = \underbrace{200{,}000 \text{ shares} \times \frac{\$25}{\text{share}}}_{\text{There are 200,000 outstanding shares at \$25 each.}} + \underbrace{10{,}000 \text{ shares} \times \frac{\$20}{\text{shares}}}_{\text{There will be 10,000 new shares issued at a \$20 subscription price.}}$$

What Is the Ex-Rights Price?

- There are 210,000 outstanding shares of a firm with a market value of $5,200,000.
- Thus the value of an ex-rights share is:

$$\frac{\$5{,}200{,}000}{210{,}000 \text{ shares}} = \$24.7619$$

What Is the Ex-Rights Price?

- Thus, the value of a right is:

$$\$0.2381 = \$25 - \$24.7619$$

Rights Offer Example 2

Musical Instruments, Inc. would like to raise $15 million through a rights offering. The firm currently has 1.8 million shares of stock outstanding at a market price of $42 a share. The subscription price has been set at $25 a share and one right will be issued for each share of outstanding stock.

How many new shares will be issued?

How many rights will be required to purchase one of the new shares?

What is the value of one right?

What is the ex-rights stock price?

Rights Offer Example 2 Cont.

$$\text{Number of new shares to be issued} = \frac{\$15{,}000{,}000}{\$25} = 600{,}000$$

$$\text{Number of rights issued} = 1{,}800{,}000 \times 1 = 1{,}800{,}000$$

$$\text{Number of rights needed for each new share} = \frac{1{,}800{,}000}{600{,}000} = 3$$

$$\text{Value of right} = \text{Current market price} - \frac{\text{Total invested}}{\text{Total shares}}$$

$$= \$42 - \frac{(3 \times \$42) + (1 \times \$25)}{3 + 1}$$

$$= \$42 - \$37.75$$

$$= \$4.25$$

$$\text{Ex-rights price} = \text{Subscription price} + (\text{Number of rights} \times \text{Value per right})$$

$$= \$25 + (3 \times \$4.25)$$

$$= \$37.75$$

20.9 The Private Equity Market

- The previous sections of this chapter assumed that a company is big enough, successful enough, and old enough to raise capital in the public equity market.
- For start-up firms and firms in financial trouble, the public equity market is often not available.

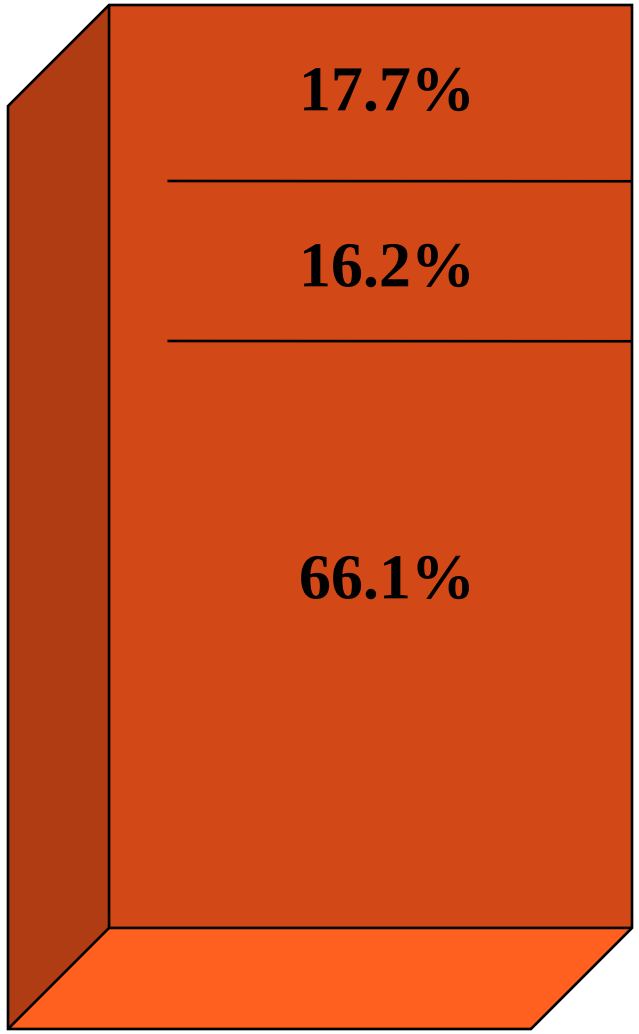
Private Placements

- Private placements avoid the costly procedures associated with the registration requirements that are a part of public issues.
- The SEC restricts private placement issues to no more than a couple of dozen knowledgeable investors, including institutions such as insurance companies and pension funds.
- The biggest drawback is that the securities cannot be easily resold.

Venture Capital

- The limited partnership is the dominant form of intermediation in this market.
- There are four types of suppliers of venture capital:
  1. Old-line wealthy families
  2. Private partnerships and corporations
  3. Large industrial or financial corporations have established venture-capital subsidiaries.
  4. Individuals, typically with incomes in excess of $100,000 and net worth over $1,000,000. Often these “angels” have substantial business experience and are able to tolerate high risks

Corporate Equity Security Offerings



Private Rule 144A placements

Private non-Rule 144A placements

Public equity offering

Source: Jennifer E. Bethal and Erik R. Sirri, “Express Lane or Toll Booth in the Desert: The Sec of Framework for Securities Issuance,” *Journal of Applied Corporate Finance* (Spring 1998).

Reading Assignment

- Please read the textbook for the following topics.

The Process of a Public Offering

Steps in Public Offering	Time
1. Pre-underwriting conferences	Several months
2. Registration statements	20-day waiting period
3. Pricing the issue	Usually on the 20th day
4. Public offering and sale	After the 20th day
5. Market stabilization	30 days after offering

Table 20.2 - I

Method	Type	Definition
Public Traditional negotiated cash offer	Firm commitment cash offer	Company negotiates an agreement with an investment banker to underwrite and distribute the new shares. A specified number of shares are bought by underwriters and sold at a higher price.
	Best efforts cash offer	Company has investment bankers sell as many of the new shares as possible at the agreed-upon price. There is no guarantee concerning how much cash will be raised.
	Dutch auction cash offer	Company has investment bankers auction shares to determine the highest offer price obtainable for a given number of shares to be sold.
Privileged subscription	Direct rights offer	Company offers the new stock directly to its existing shareholders.
	Standby rights offer	Like the direct rights offer, this contains a privileged subscription arrangement with existing shareholders. The net proceeds are guaranteed by the underwriters.

Table 20.2 - II

Method	Type	Definition
Public		
Nontraditional cash offer	Shelf cash offer	Qualifying companies can authorize all shares they expect to sell over a two-year period and sell them when needed.
	Competitive firm cash offer	Company can elect to award the underwriting contract through a public auction instead of negotiation.
Private	Direct placement	Securities are sold directly to the purchaser, who, at least until recently, generally could not resell securities for at least two years.

20.8 Shelf Registration

- Permits a corporation to register an offering that it reasonably expects to sell within the next two years.
- Not all companies are allowed shelf registration.
- Qualifications include:
  - The firm must be rated investment grade.
  - They cannot have recently defaulted on debt.
  - The market capitalization must be $\geq$ \$75 m.
  - No recent SEC violations.

Chapter 22
Options and Corporate Finance

22.1 Options

- An option gives the holder the right, *but not the obligation*, to buy or sell a given quantity of an asset on (or before) a given date, at prices agreed upon today.
- Exercising the Option
  - The act of buying or selling the underlying asset
- Strike Price or Exercise Price
  - Refers to the fixed price in the option contract at which the holder can buy or sell the underlying asset
- Expiry (Expiration Date)
  - The maturity date of the option

Options

- European versus American options
  - European options can be exercised only at expiration date.
  - American options can be exercised at any time up to expiration date.
- In-the-Money
  - Exercising the option would result in a positive payoff.
- At-the-Money
  - Exercising the option would result in a zero payoff (i.e., exercise price equal to spot price).
- Out-of-the-Money
  - Exercising the option would result in a negative payoff.

22.5 Option Quotes

			--Call--		--Put--	
Option/Strike		**Exp.**	**Vol.**	**Last**	**Vol.**	**Last**
IBM	130	Oct	364	15¼	107	5¼
138¼	130	Jan	112	19½	420	9¼
138¼	135	Jul	2365	4¾	2431	13/16
138¼	135	Aug	1231	9¼	94	5½
138¼	140	Jul	1826	1¾	427	2¾
138¼	140	Aug	2193	6½	58	7½

Option Quotes

This option has a strike price of $135;

			--Call--		--Put--	
Option/Strike		**Exp.**	**Vol.**	**Last**	**Vol.**	**Last**
IBM	130	Oct	364	15¼	107	5¼
138¼	130	Jan	112	19½	420	9¼
138¼	135	Jul	2365	4¾	2431	13/16
138¼	135	Aug	1231	9¼	94	5½
138¼	140	Jul	1826	1¾	427	2¾
138¼	140	Aug	2193	6½	58	7½

a recent price for the stock is $138.25;

July is the expiration month.

Option Quotes

This makes a call option with this exercise price in-the-money by \$3.25 = \$138¼ – \$135.

			--Call--		--Put--	
Option/Strike		**Exp.**	**Vol.**	**Last**	**Vol.**	**Last**
IBM	130	Oct	364	15¼	107	5¼
138¼	130	Jan	112	19½	420	9¼
138¼	135	Jul	2365	4¾	2431	13/16
138¼	135	Aug	1231	9¼	94	5½
138¼	140	Jul	1826	1¾	427	2¾
138¼	140	Aug	2193	6½	58	7½

Puts with this exercise price are out-of-the-money.

Option Quotes

			--Call--		--Put--	
Option/Strike		**Exp.**	**Vol.**	**Last**	**Vol.**	**Last**
IBM	130	Oct	364	15¼	107	5¼
138¼	130	Jan	112	19½	420	9¼
138¼	135	Jul	2365	4¾	2431	13/16
138¼	135	Aug	1231	9¼	94	5½
138¼	140	Jul	1826	1¾	427	2¾
138¼	140	Aug	2193	6½	58	7½

On this day, 2,365 call options with this exercise price were traded.

Option Quotes

The CALL option with a strike price of $135 is trading for $4.75.

			--Call--		--Put--	
Option/Strike		**Exp.**	**Vol.**	**Last**	**Vol.**	**Last**
IBM	130	Oct	364	15¼	107	5¼
138¼	130	Jan	112	19½	420	9¼
138¼	135	Jul	2365	4¾	2431	13/16
138¼	135	Aug	1231	9¼	94	5½
138¼	140	Jul	1826	1¾	427	2¾
138¼	140	Aug	2193	6½	58	7½

Since the option is on 100 shares of stock, buying this option would cost $475 plus commissions.

Option Quotes

			--Call--		--Put--	
Option/Strike		**Exp.**	**Vol.**	**Last**	**Vol.**	**Last**
IBM	130	Oct	364	15¼	107	5¼
138¼	130	Jan	112	19½	420	9¼
138¼	135	Jul	2365	4¾	2431	13/16
138¼	135	Aug	1231	9¼	94	5½
138¼	140	Jul	1826	1¾	427	2¾
138¼	140	Aug	2193	6½	58	7½

On this day, 2,431 put options with this exercise price were traded.

Option Quotes

The PUT option with a strike price of $135 is trading for $.8125.

			--Call--		--Put--	
Option/Strike		**Exp.**	**Vol.**	**Last**	**Vol.**	**Last**
IBM	130	Oct	364	15¼	107	5¼
138¼	130	Jan	112	19½	420	9¼
138¼	135	Jul	2365	4¾	2431	13/16
138¼	135	Aug	1231	9¼	94	5½
138¼	140	Jul	1826	1¾	427	2¾
138¼	140	Aug	2193	6½	58	7½

Since the option is on 100 shares of stock, buying this option would cost $81.25 plus commissions.

22.2 Call Options

- Call options gives the holder the right, but not the obligation, to **buy** a given quantity of some asset on or before some time in the future, at prices agreed upon today.
- When exercising a call option, you "call in" the asset.

Call Option Pricing at Expiry

- At expiration date, an American call option is worth the same as a European option with the same characteristics.
  - If the call is in-the-money, it is worth $S_T - E$.
  - If the call is out-of-the-money, it is worthless.
  - $C = \text{Max}[S_T - E, 0]$

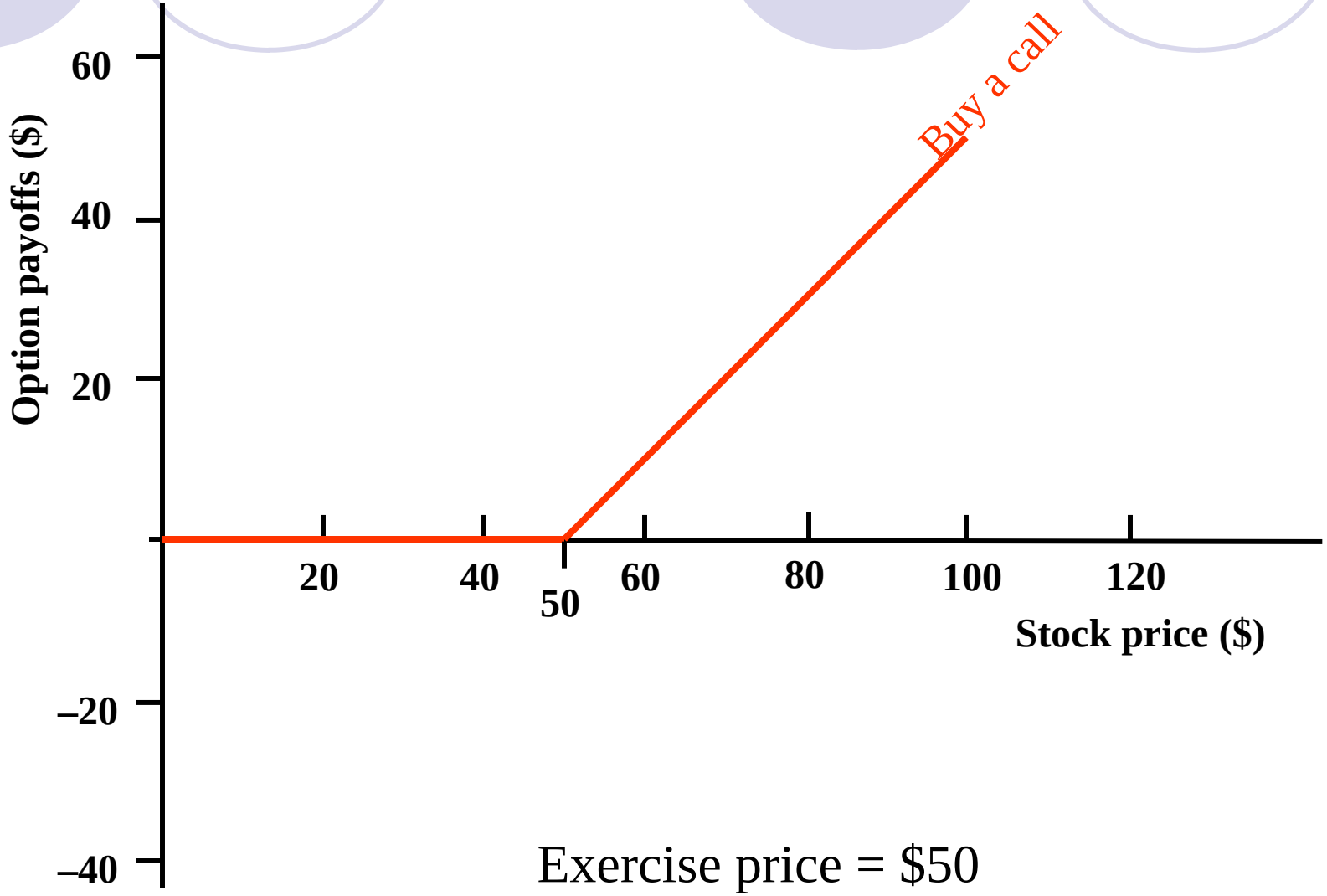
Where

S_T is the value of the stock at expiry (time T)

E is the exercise price.

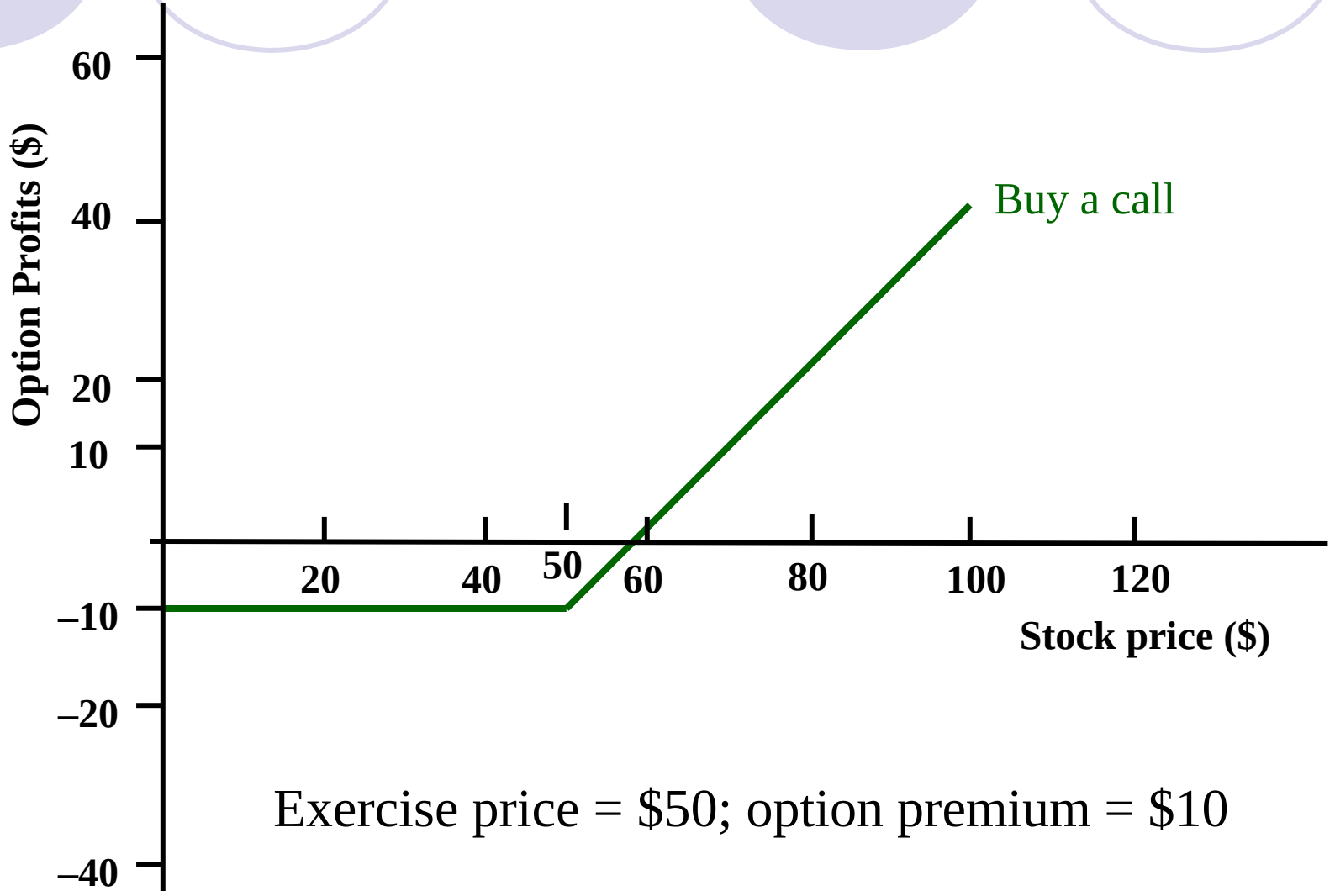
C is the value of the call option at expiry

Call Option Payoffs



Exercise price = $50

Call Option Profits



Exercise price = $50; option premium = $10

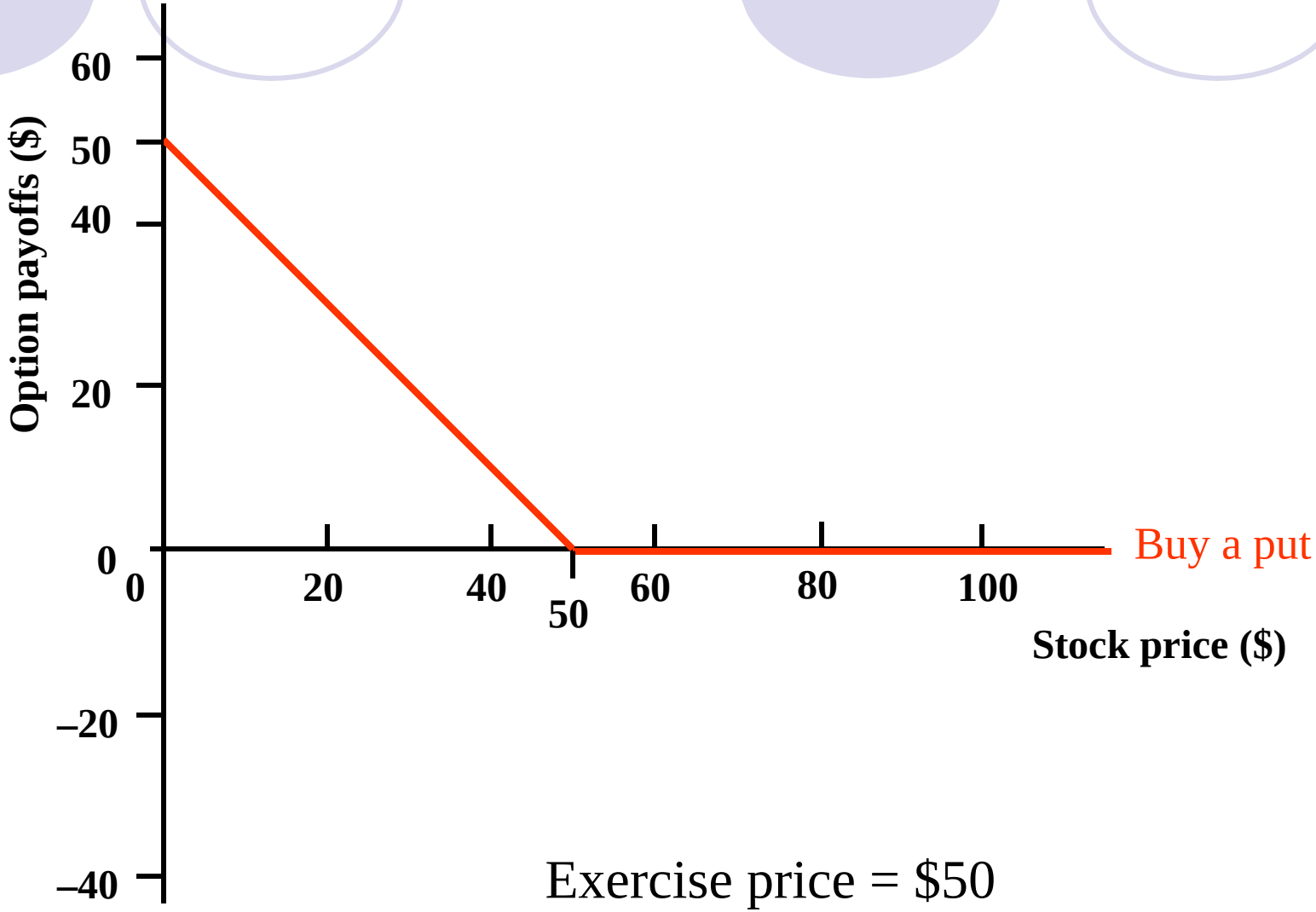
22.3 Put Options

- Put options gives the holder the right, but not the obligation, to **sell** a given quantity of an asset on or before some time in the future, at prices agreed upon today.
- When exercising a put, you “put” the asset to someone.

Put Option Pricing at Expiry

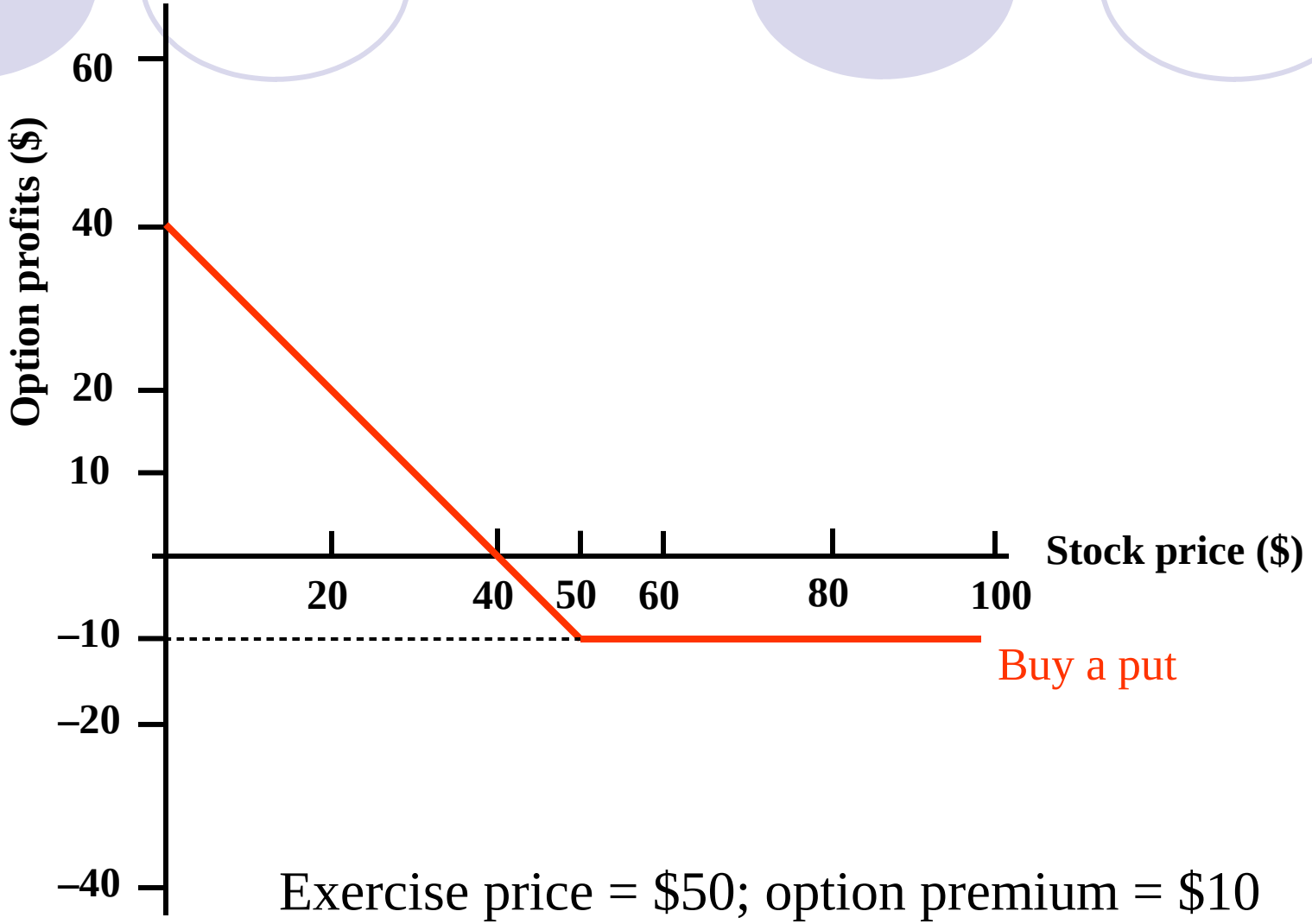
- At expiration date, an American put option is worth the same as a European option with the same characteristics.
- If the put is in-the-money, it is worth $E - S_T$.
- If the put is out-of-the-money, it is worthless.
- $P = Max[E - S_T, 0]$

Put Option Payoffs



Exercise price = $50

Put Option Profits

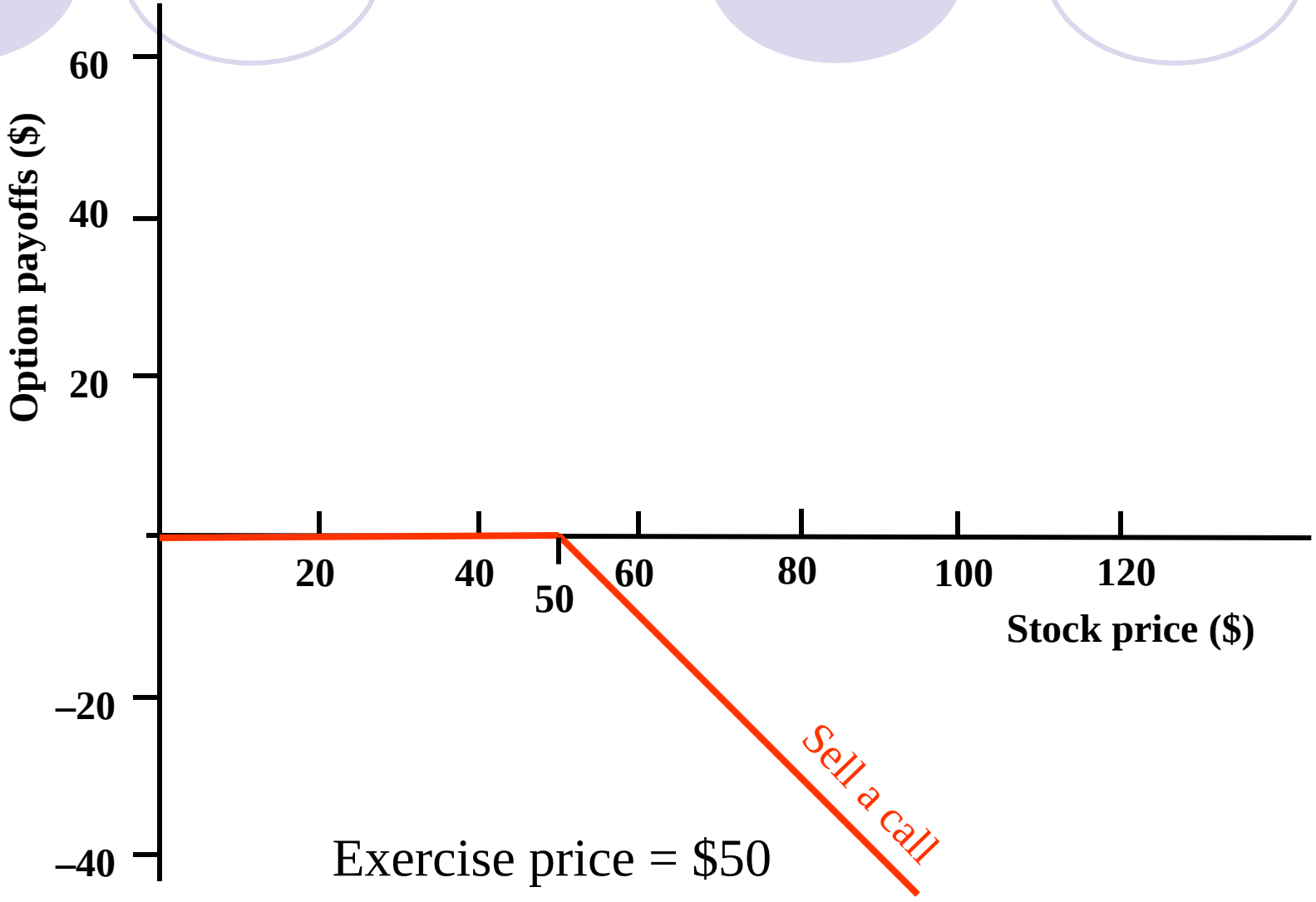


Exercise price = $50; option premium = $10

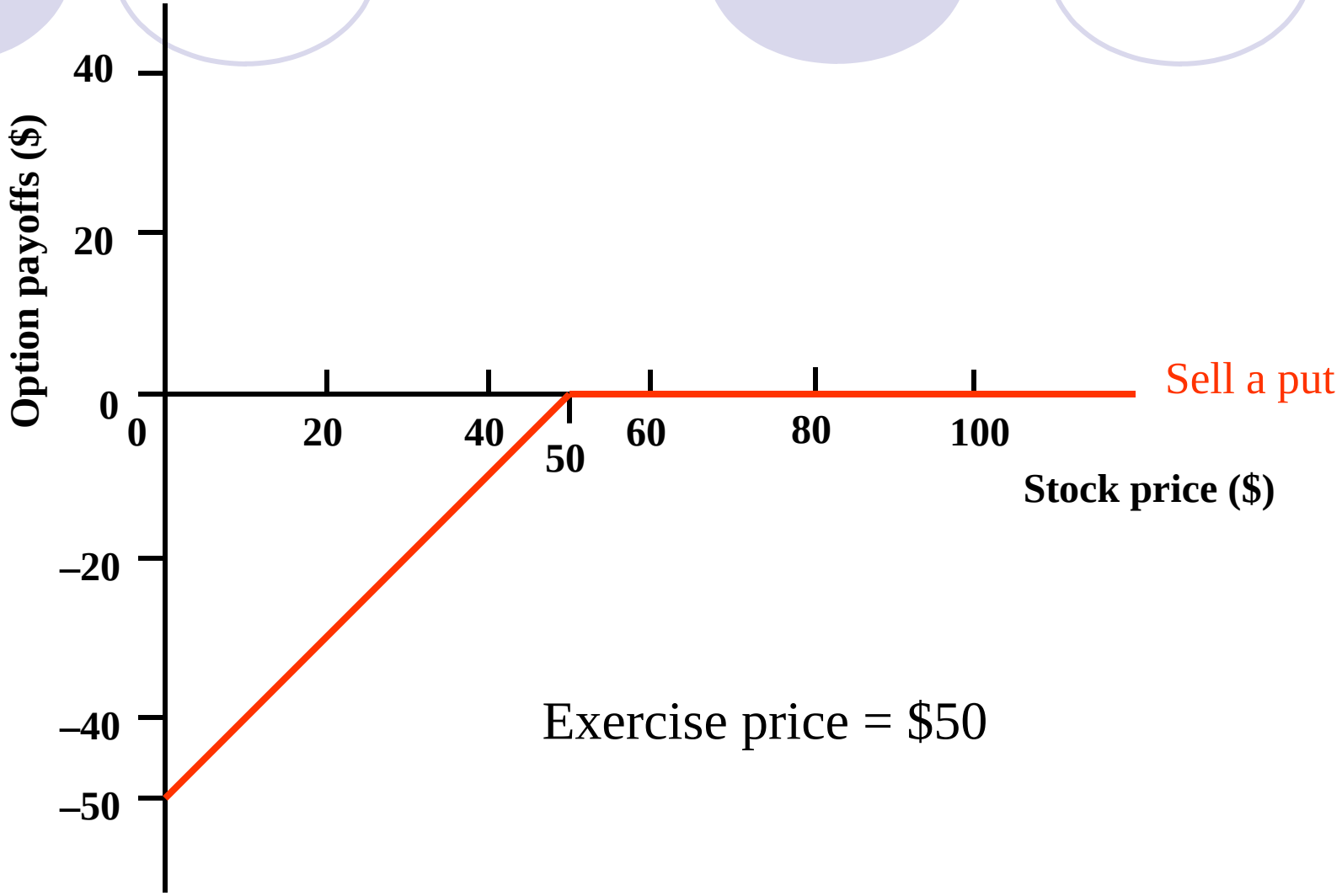
22.4 Selling Options

- The seller (or writer) of an option has an **obligation**.
- The seller receives the option premium in exchange.

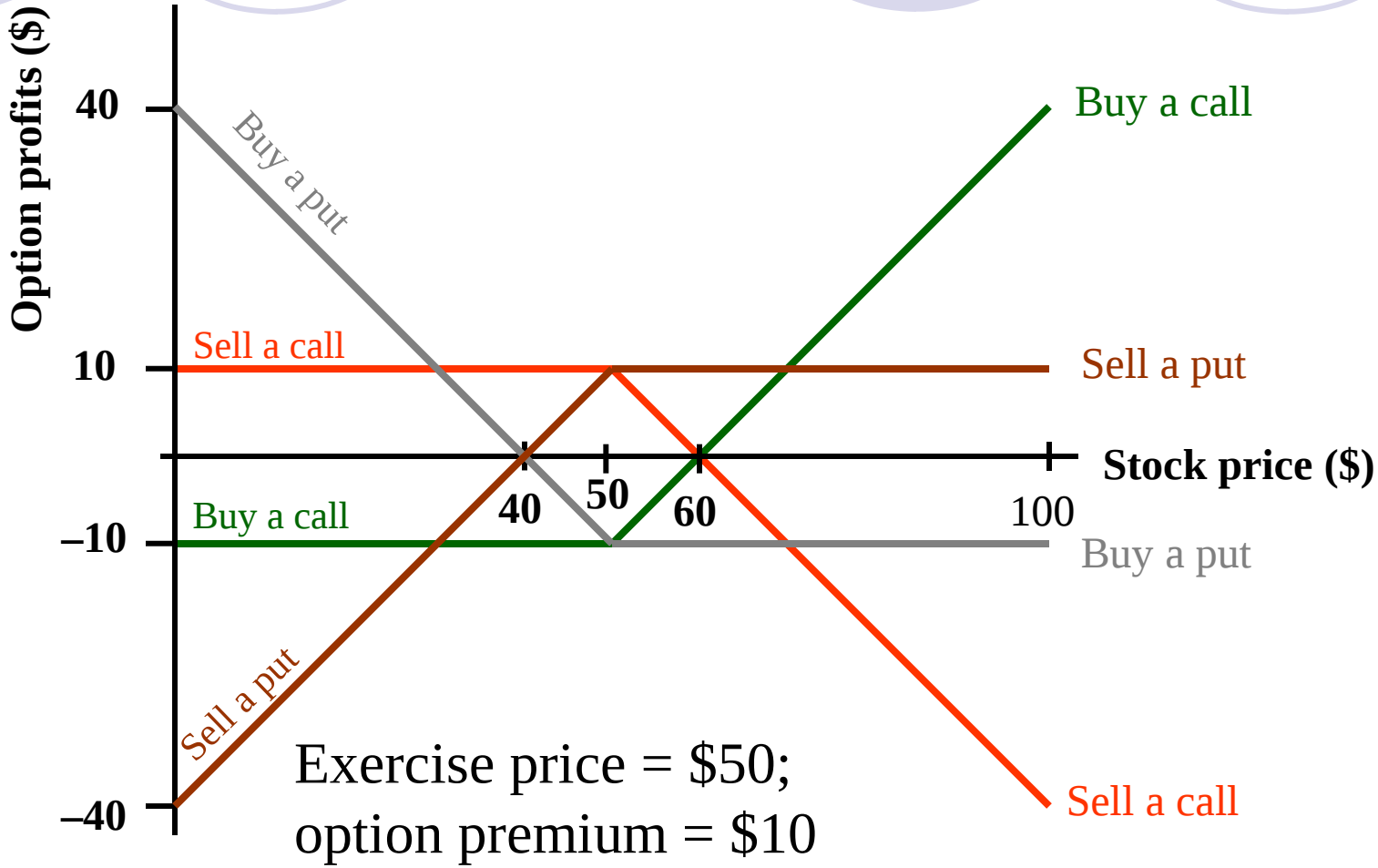
Call Option Payoffs



Put Option Payoffs



Option Diagrams Revisited



Option Value

- Intrinsic Value
  - Call: Max[$S_T - E$, 0]
  - Put: Max[$E - S_T$, 0]
- Speculative Value
  - The difference between the option premium and the intrinsic value of the option.

Option Premium	=	Intrinsic Value	+	Speculative Value

22.5 Option Quotes

			--Call--		--Put--	
Option/Strike		**Exp.**	**Vol.**	**Last**	**Vol.**	**Last**
IBM	130	Oct	364	15¼	107	5¼
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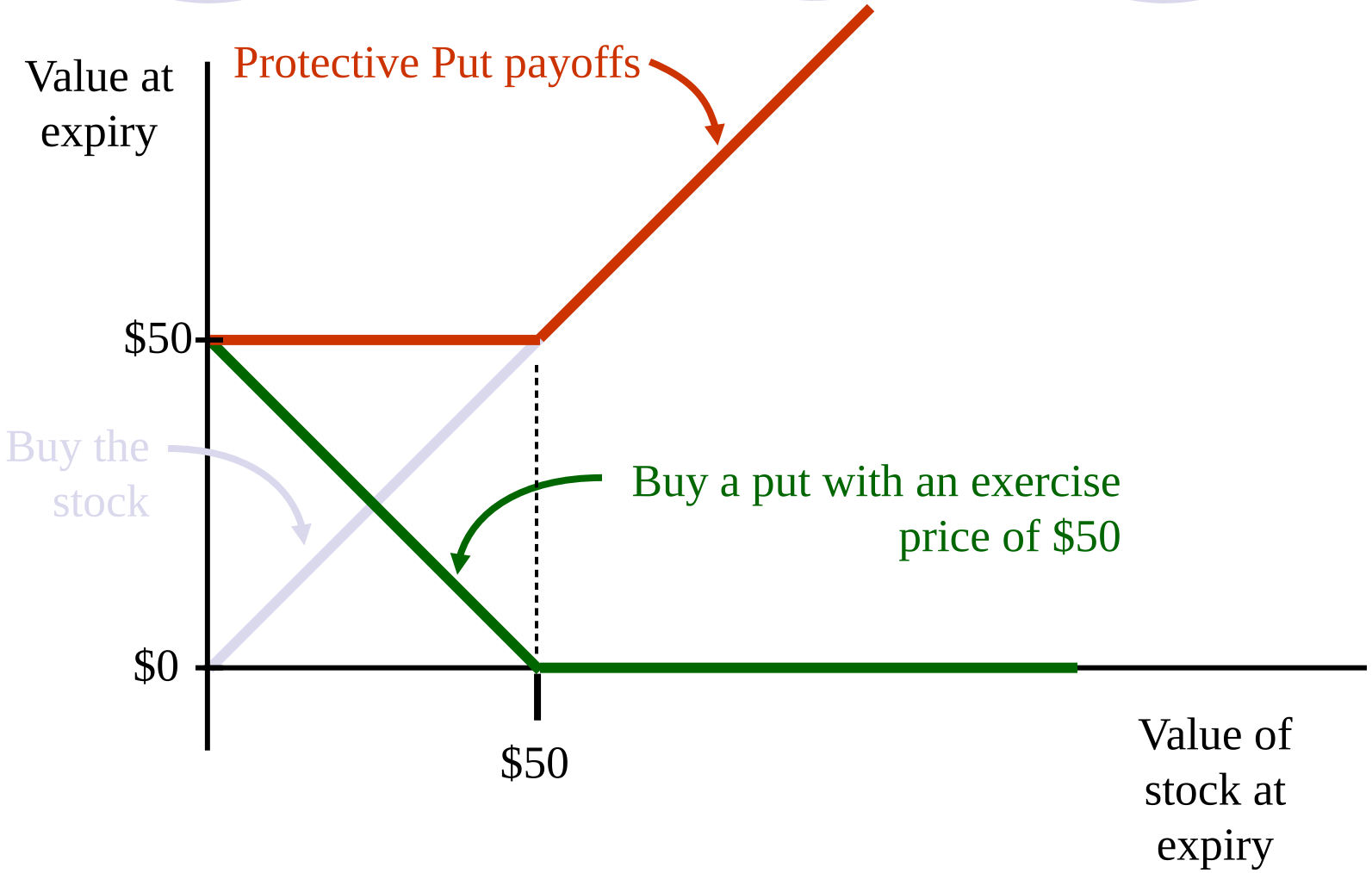
138¼	140	Jul	1826	1¾	427	2¾
138¼	140	Aug	2193	6½	58	7½

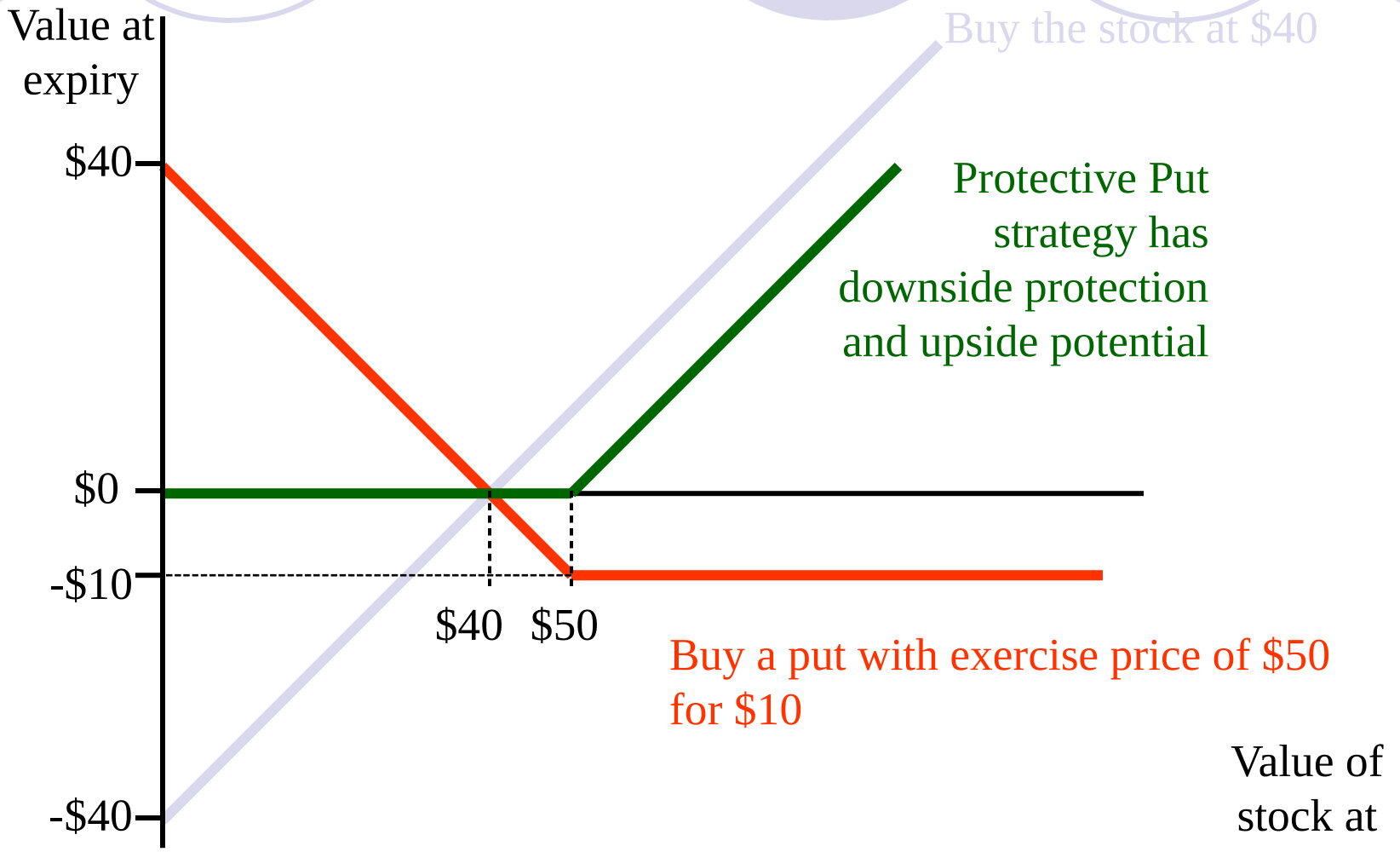
22.6 Combinations of Options

- Puts and calls can serve as the building blocks for more complex option contracts.
- If you understand this, you can become a financial engineer, tailoring the risk-return profile to meet your client’s needs.

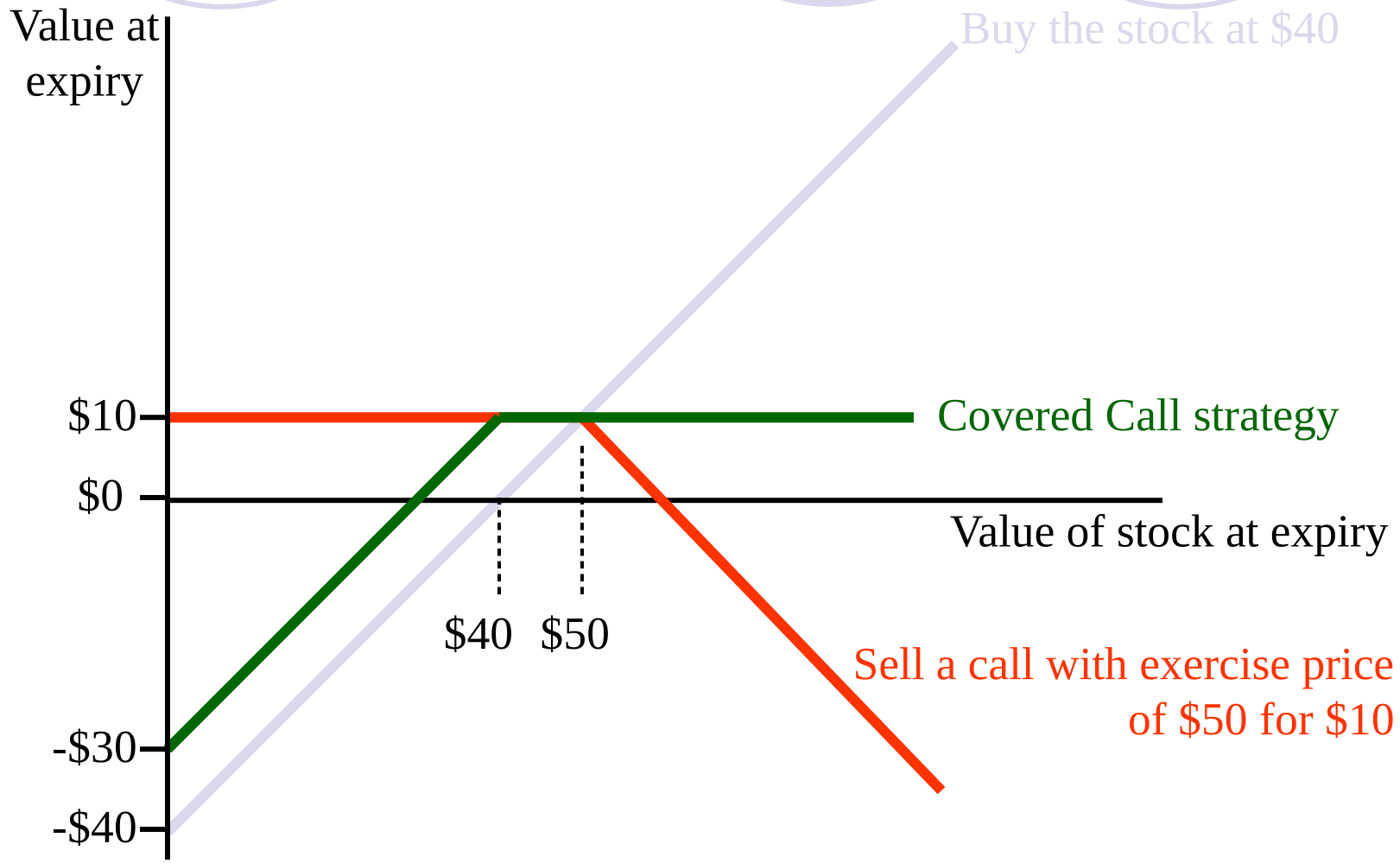
Protective Put Strategy (Payoffs)



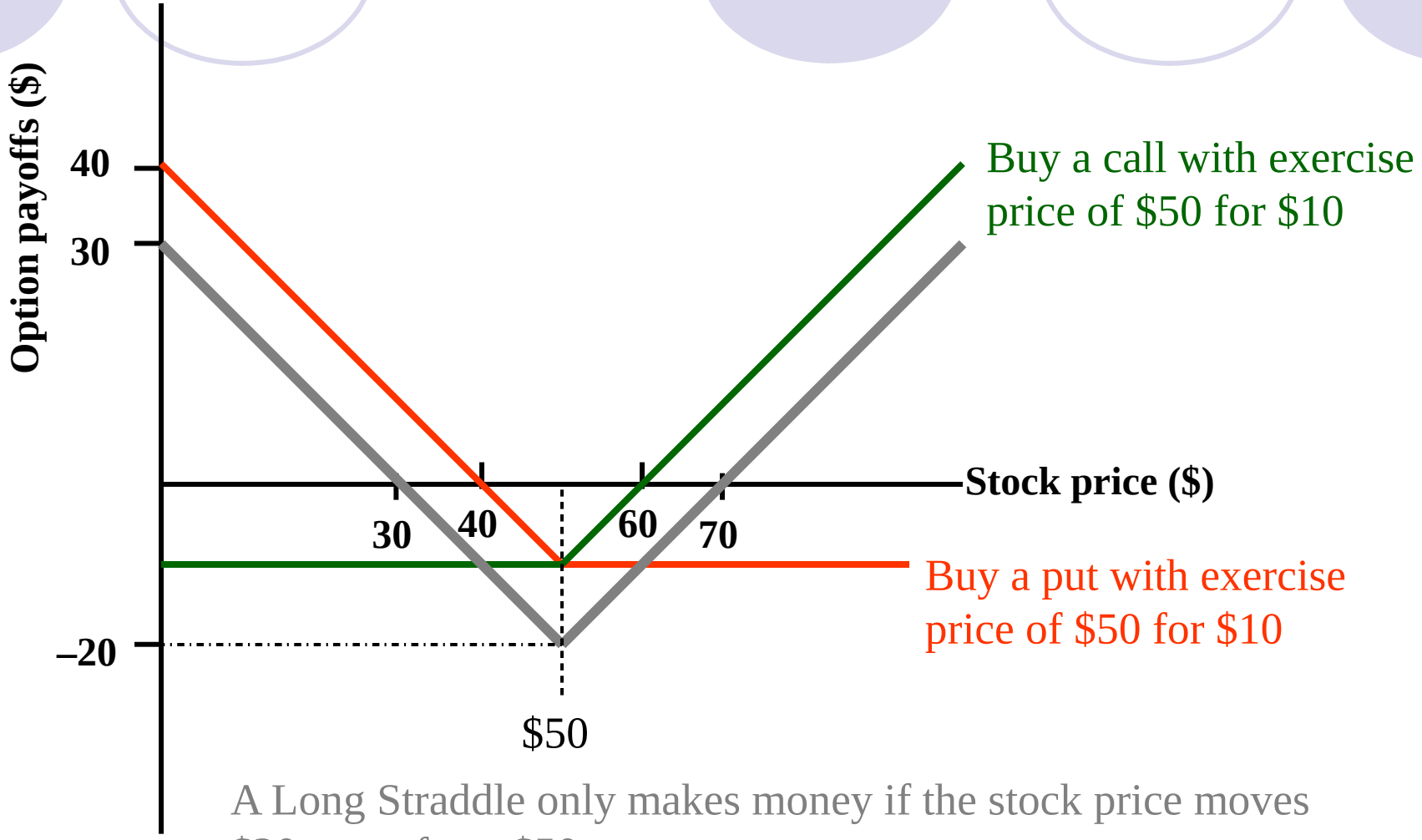
Protective Put Strategy (Profits)



Covered Call Strategy

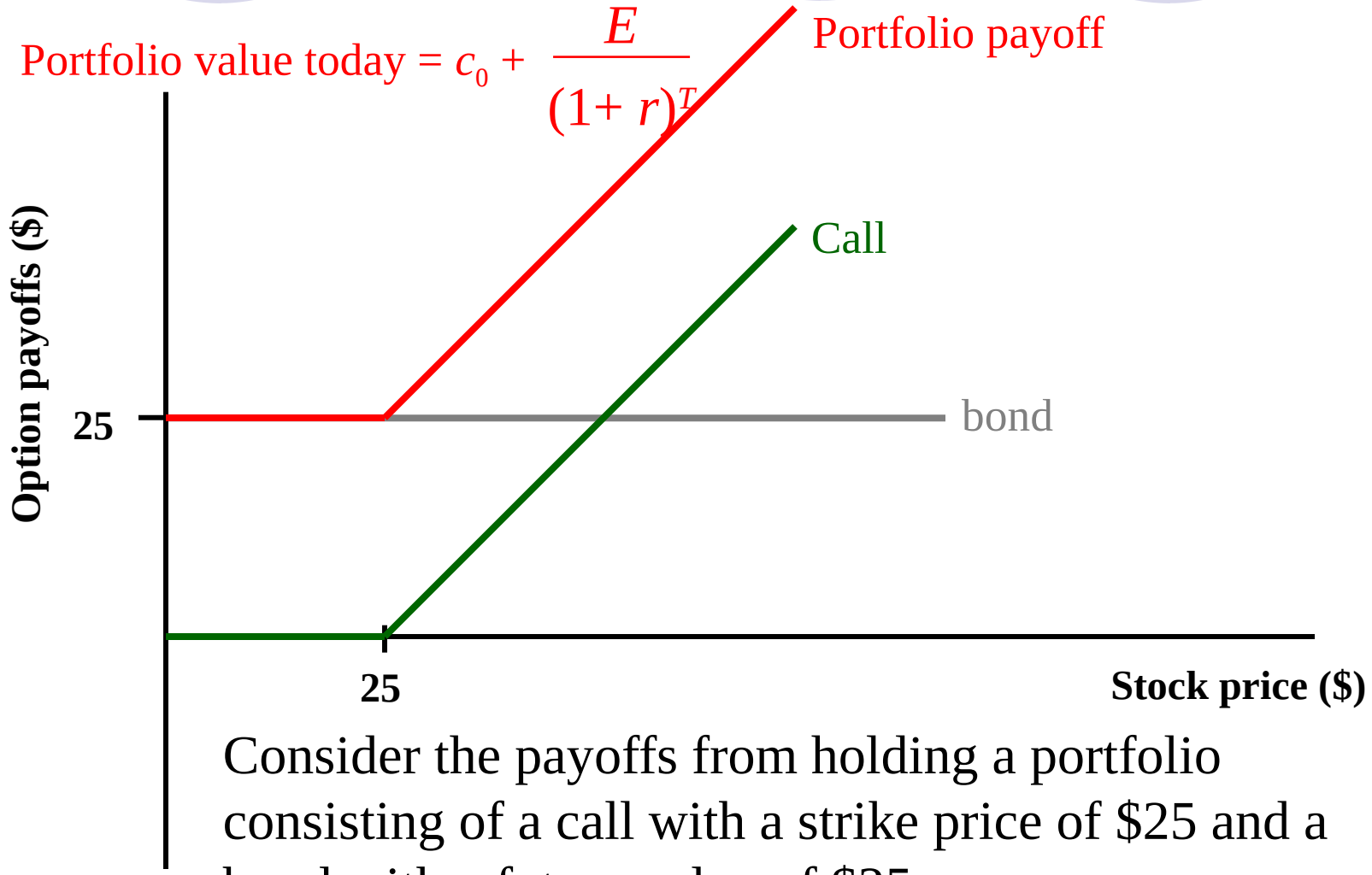


Long Straddle



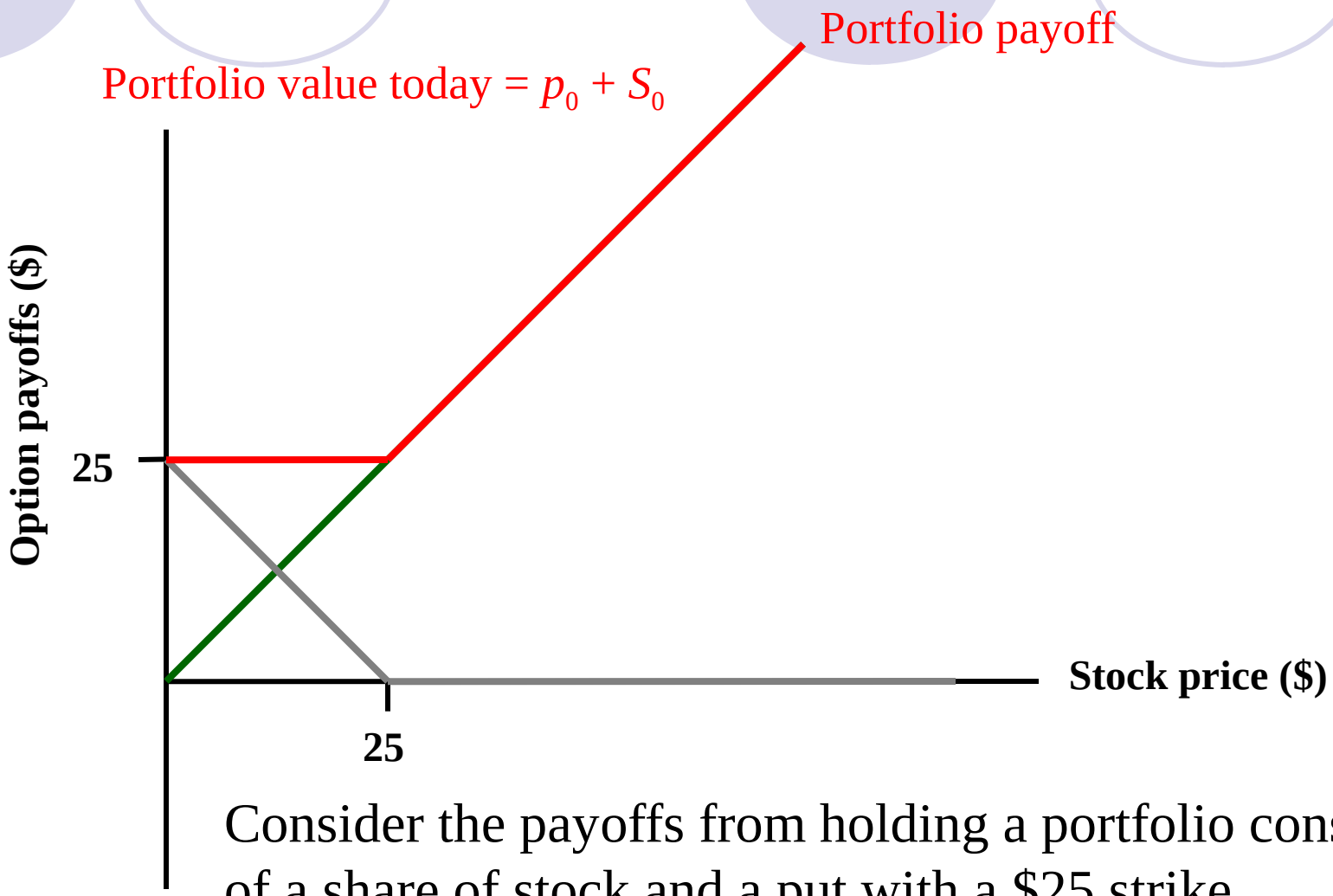
A Long Straddle only makes money if the stock price moves $20 away from $50.

Put-Call Parity: $p_0 + S_0 = c_0 + E/(1+ r)^T$



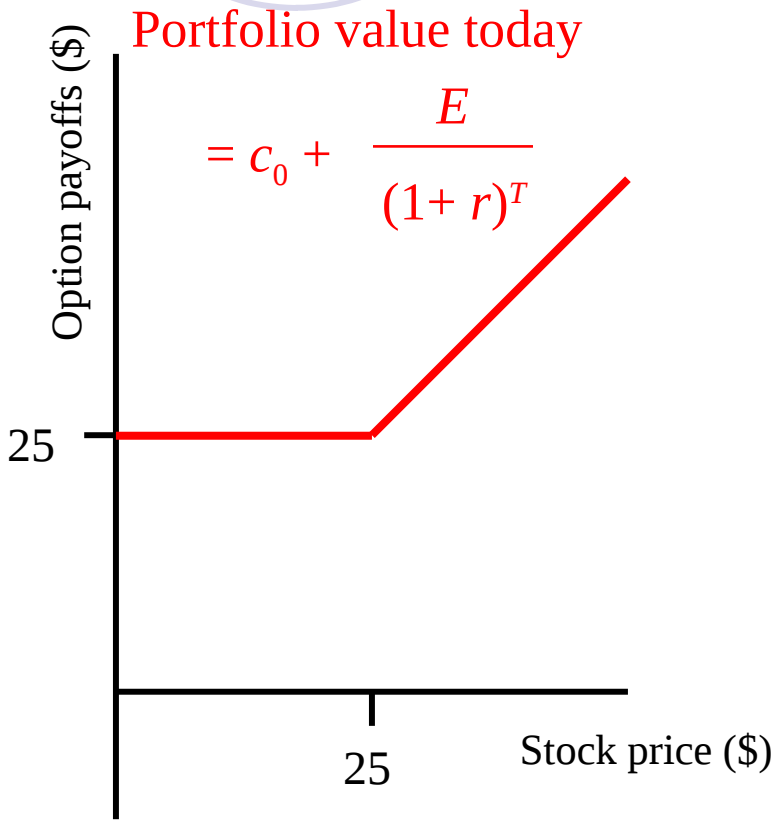
Consider the payoffs from holding a portfolio consisting of a call with a strike price of $25 and a bond with a future value of $25.

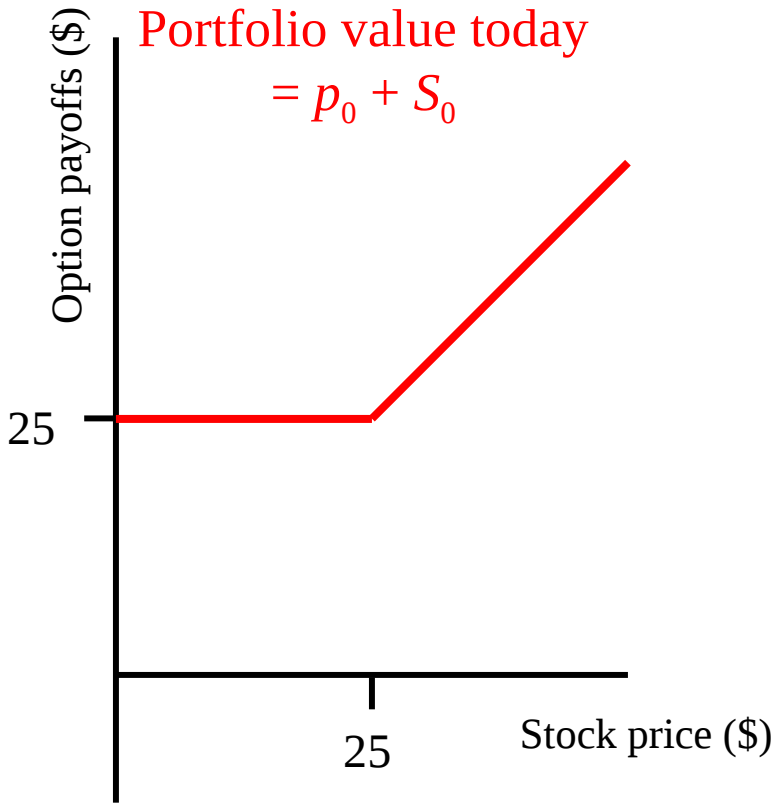
Put-Call Parity



Consider the payoffs from holding a portfolio consisting of a share of stock and a put with a $25 strike.

Put-Call Parity





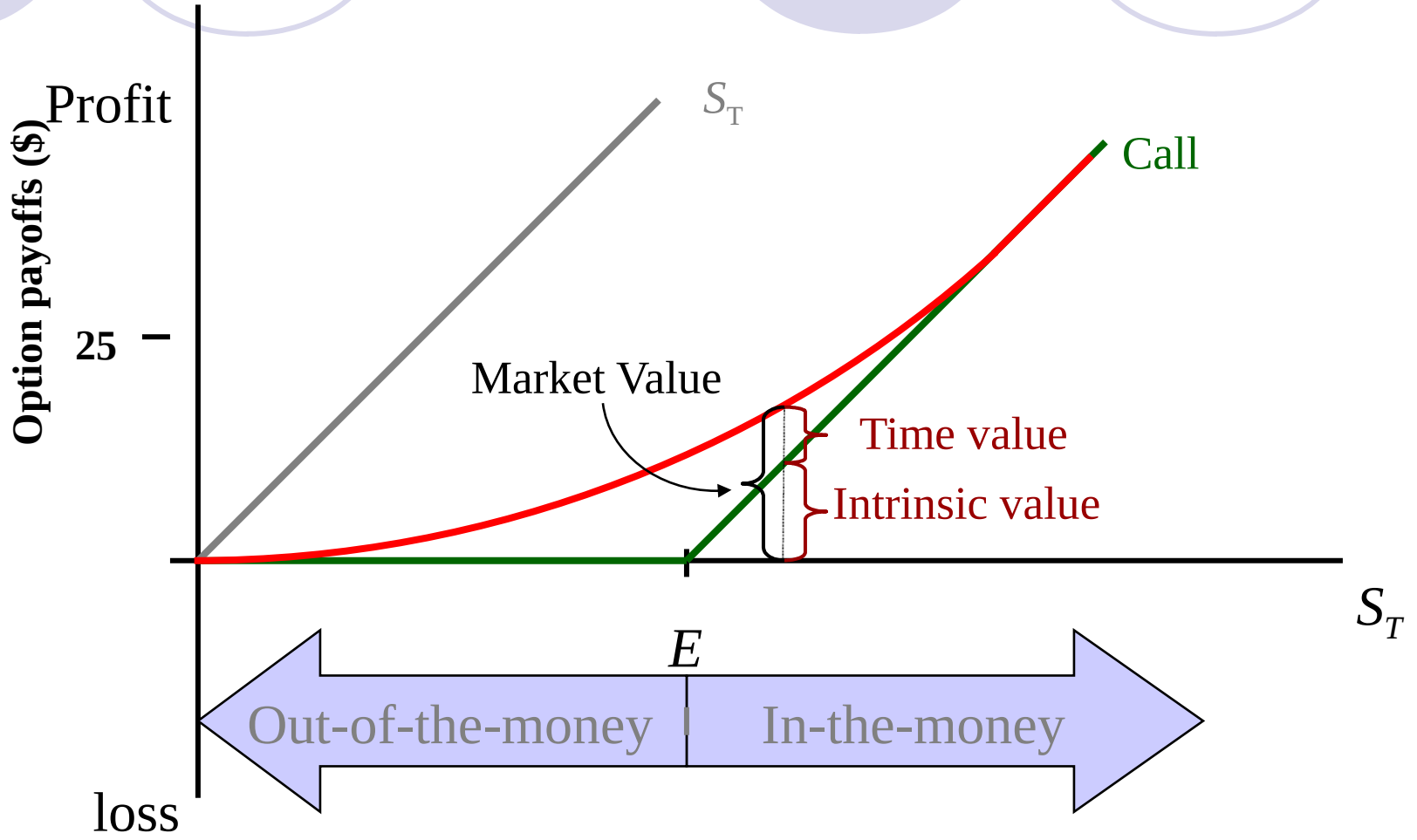
Since these portfolios have identical payoffs, they must have the same value today: hence

Put-Call Parity: $c_0 + E/(1+r)^T = p_0 + S_0$

22.7 Valuing Options

- The last section concerned itself with the value of an option at expiration.
- This section considers the value of an option prior to the expiration date.
  - A much more interesting question.

American Call



C_0 must fall within $\max(S_0 - E, 0) \leq C_0 \leq S_0$.

Delta

- This practice of the construction of a riskless hedge is called *delta hedging*.
- The delta of a call option is positive.
  - Suppose a stock is worth $25 today and in one period will either be $28.75 or $21.25. If the exercise price is $25.

$$\Delta = \frac{\text{Swing of call}}{\text{Swing of stock}}$$

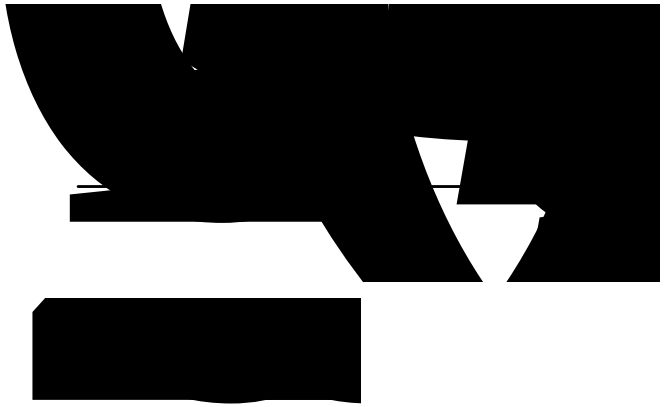
- The delta of a put option is negative.

The Black-Scholes Model

Where

C_0 = the value of a European option at time $t = 0$

r = the risk-free interest rate.



N(d) = Probability that a standardized, normally distributed, random variable will be less than or equal to d.

The Black-Scholes Model allows us to value options in the real world just as we have done in the 2-state world.

The Black-Scholes Model

Find the value of a six-month call option on Microsoft with an exercise price of $150.

The current value of a share of M is $160.

The interest rate available in the U.S. is $r = 5\%$.

The option maturity is 6 months (half of a year).

The volatility of the underlying asset is 30% per annum.

Before we start, note that the *intrinsic value* of the option is $10—our answer must be at least that amount.

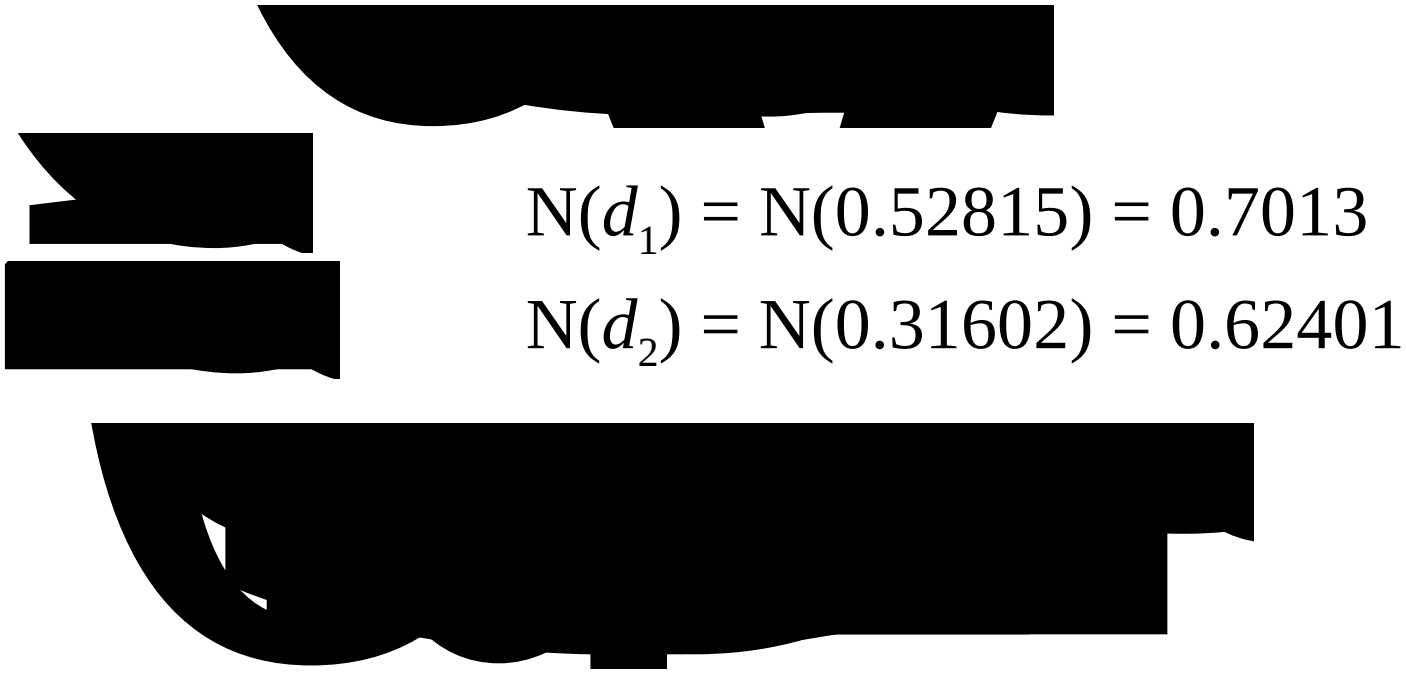
The Black-Scholes Model

Let’s try our hand at using the model. If you have a calculator handy, follow along.

First calculate d_1 and d_2

Then,

The Black-Scholes Model



$$N(d_1) = N(0.52815) = 0.7013$$

$$N(d_2) = N(0.31602) = 0.62401$$

22.9 Stocks and Bonds as Options

- Levered equity is a call option.
  - The underlying asset comprises the assets of the firm.
  - The strike price is the payoff of the bond.
- If at the maturity of their debt, the assets of the firm are greater in value than the debt, the shareholders have an in-the-money call. They will pay the bondholders and “call in” the assets of the firm.
- If at the maturity of the debt the shareholders have an out-of-the-money call, they will not pay the bondholders (*i.e.* the shareholders will declare bankruptcy) and let the call expire.

Stocks and Bonds as Options

- Levered equity is a put option.
  - The underlying asset comprises the assets of the firm.
  - The strike price is the payoff of the bond.
- If at the maturity of their debt, the assets of the firm are less in value than the debt, shareholders have an in-the-money put.
- They will put the firm to the bondholders.
- If at the maturity of the debt the shareholders have an out-of-the-money put, they will not exercise the option (*i.e.* NOT declare bankruptcy) and let the put expire.

Stocks and Bonds as Options

- It all comes down to put-call parity.

$$c_0 = S_0 + p_0 - \frac{E}{(1+r)^T}$$

Value of a call on the firm = Value of the firm + **Value of a put on the firm** − **Value of a risk-free bond**

Stockholder's position in terms of call options

Stockholder's position in terms of put options

Options and Capital Budgeting

- Stockholders may prefer low NPV projects to high NPV projects if the firm is highly leveraged and the low NPV project increases volatility.
- Consider a company with the following characteristics:
  - MV assets = 40 million
  - Face Value debt = 25 million
  - Debt maturity = 5 years
  - Asset return standard deviation = 40%
  - Risk-free rate = 4%

Example: Low NPV

- Current market value of equity = $22.706 million
- Current market value of debt = $17.294 million

	Project I	Project II
NPV	$3	$1
MV of assets	$43	$41
Asset return standard deviation	30%	50%
MV of equity	$23.831	$25.381
MV of debt	$19.169	$15.619

Example: Low NPV

- Which project should management take?
- Even though project II has a lower NPV, it is better for stockholders.
- The firm has a relatively high amount of leverage:
  - With project I, the bondholders share in the NPV because it reduces the risk of bankruptcy.
  - With project II, the stockholders actually appropriate additional wealth from the bondholders for a larger gain in value.

Example: Negative NPV

- We have seen that stockholders might prefer a low NPV to a high one, but would they ever prefer a negative NPV?
- Under certain circumstances, they might.
- If the firm is highly leveraged, stockholders have nothing to lose if a project fails, and everything to gain if it succeeds.
- Consequently, they may prefer a very risky project with a negative NPV but high potential rewards.

Example: Negative NPV

- Consider the previous firm.
- They have one additional project they are considering with the following characteristics
  - Project NPV = -$2 million
  - MV of assets = $38 million
  - Asset return standard deviation = 65%
- Estimate the value of the debt and equity
  - MV equity = $25.453 million
    - Current market value of equity = $22.706 million
  - MV debt = $12.547 million

Example: Negative NPV

- In this case, stockholders would actually prefer the negative NPV project to either of the positive NPV projects.
- The stockholders benefit from the increased volatility associated with the project even if the expected NPV is negative.
- This happens because of the large levels of leverage.

Options and Capital Budgeting

- As a general rule, managers should not accept low or negative NPV projects and pass up high NPV projects.
- Under certain circumstances, however, this may benefit stockholders:
  - The firm is highly leveraged
  - The low or negative NPV project causes a substantial increase in the standard deviation of asset returns