Options Market

Chapter Objectives

- provide a background on options
- explain why stock option premiums vary
- explain how stock options are used to speculate
- explain how stock options are used to hedge

Background on Options

Call Option: right to buy underlying financial instrument at exercise price (or strike price) within a specified period of time.

- **In the money** when market price > exercise price
- **At the money** when market price = exercise price
- **Out of the money** when market price < exercise price

Put Option: right to sell underlying financial instrument at exercise price (or strike price) within a specified period of time.

- **In the money** when market price < exercise price
- **At the money** when market price = exercise price
- **Out of the money** when market price > exercise price

Background on Options

- Comparison of Options and Futures
  - To obtain an option, a premium must be paid in addition to the price of the financial instrument.
  - The owner of an option can choose to let the option expire on the expiration date without exercising it.

Markets Used to Trade Options

- The Chicago Board Options Exchange (CBOE), created in 1973, is the most important exchange for trading options.
- As the popularity of stock options increased, various stock exchanges began to list options.
- Listing Requirements - One key requirement is a minimum trading volume of the underlying stock.
- Role of the Options Clearing Corporation - serves as a guarantor on option contracts traded in the United States.
- Regulation of Options Trading – SEC and others.

Background on Options

- How Option Trades Are Executed
  - Computer technology allows investors to have trades executed electronically.
  - Market-makers can execute stock option transactions for customers.
- Types of Orders
  - An investor can use either a market order or a limit order for an option transaction.
  - Online Trading - Option contracts can also be purchased or sold online.

Background on Options

- Stock Option Quotations (Exhibit 14.1)
- Institutional Use of Options
- Although options positions are sometimes taken by financial institutions for speculative purposes, they are more commonly used for hedging. (Exhibit 14.2)

TYPE OF FINANCIAL INSTITUTION	PARTICIPATION IN OPTIONS MARKETS
Commercial banks	• Sometimes offer options to businesses.
Savings institutions	• Sometimes take positions in options on futures contracts to hedge interest rate risk.
Mutual funds	• Stock mutual funds take positions in stock index options to hedge against a possible decline in prices of stocks in their portfolios. • Stock mutual funds sometimes take speculative positions in stock index options in an attempt to increase their returns. • Bond mutual funds sometimes take positions in options on futures to hedge interest rate risk.
Securities firms	• Serve as brokers by executing stock option transactions for individuals and businesses.
Pension funds	• Take positions in stock index options to hedge against a possible decline in prices of stocks in their portfolio. • Take positions in options on futures contracts to hedge their bond portfolios against interest rate movements.
Insurance companies	• Take positions in stock index options to hedge against a possible decline in prices of stocks in their portfolio. • Take positions in options on futures contracts to hedge their bond portfolios against interest rate movements.

Viperon Company Stock Option Quotations

	STRIKE	EXP.	VOLUME	CALL	VOLUME	PUT
Option 1	45	Jun	180	4½	60	2¾
Option 2	45	Oct	70	5¾	120	3¾
Option 3	50	Jun	360	1⅛	40	5⅛
Option 4	50	Oct	90	3½	40	6½

Determinants of Call Option Premiums

- Influence of the Market Price - The higher the existing market price of the underlying financial instrument relative to the exercise price, the higher the call option premium, other things being equal. (Exhibit 14.3)
- Influence of the Stock's Volatility - The greater the volatility of the underlying stock, the higher the call option premium, other things being equal.
- Influence of the Call Option's Time to Maturity - The longer the call option's time to maturity, the higher the call option premium, other things being equal (Exhibit 14.4)

14.3 Relationship between Exercise Price and Call Option Premium on KSR Stock

EXERCISE PRICE	PREMIUM FOR APRIL EXPIRATION DATE
$130	$11\frac{5}{8}$
135	$7\frac{1}{2}$
140	$5\frac{1}{4}$
145	$3\frac{1}{4}$
150	$1\frac{7}{8}$

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Determinants of Put Option Premiums

- Influence of the Market Price - The higher the existing market price of the underlying stock relative to the exercise price, the lower the put option premium, other things being equal. (Exhibit 14.5)
- Influence of the Stock's Volatility - The greater the volatility of the underlying stock, the higher the put option premium, other things being equal.
- Influence of the Put Option's Time to Maturity - The longer the time to maturity, the higher the put option premium, other things being equal (Exhibit 14.6)

Relationship between Exercise Price and Put Option Premium on KSR Stock

EXERCISE PRICE	PREMIUM FOR JUNE EXPIRATION DATE
$130	1 7/8
135	3 1/8
140	5 3/8
145	8 1/2
150	12 1/4

Relationship between Time to Maturity and Put Option Premium on KSR Stock

EXPIRATION DATE	PREMIUM FOR OPTION WITH A $135 EXERCISE PRICE
March	½
April	3⅛
July	7¼

How Option Pricing Can Be Used to Derive a Stock's Volatility

- Some investors assess a specific stock's risk by using the option-pricing formula to estimate the stock's anticipated volatility.
- By using the prevailing option premium and values for the other factors in the option-pricing formula, the **implied volatility** or **implied standard deviation** can be estimated.

$$C = SN(d_1) - N(d_2)Ke^{-rt}$$

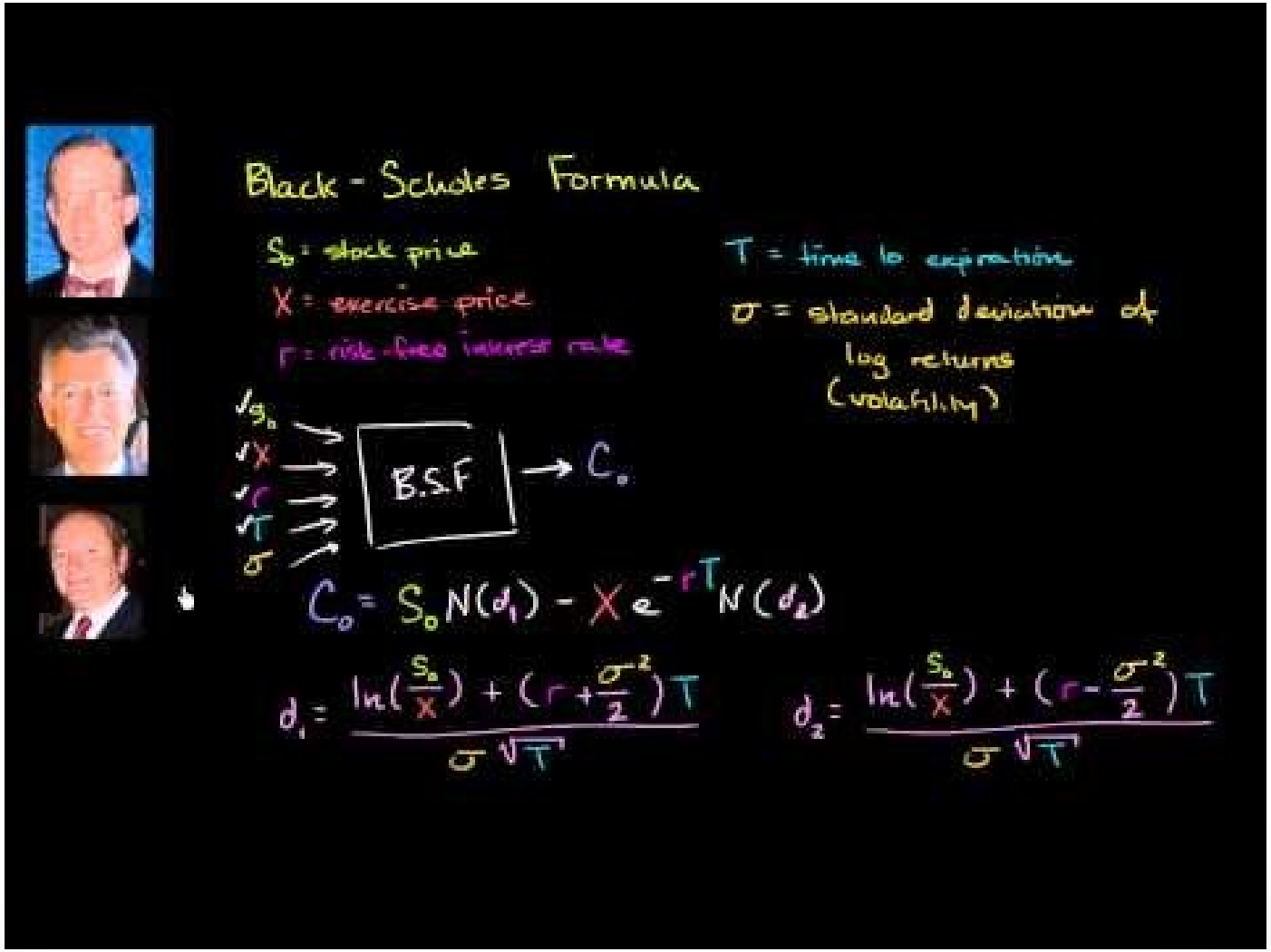
C = Call premium
S = Current stock price
t = Time until option exercise
K = Option striking price
r = Risk-free interest rate
N = Cumulative standard normal distribution
e = Exponential term

s = St. Deviation
ln = Natural Log

$$d_1 = \frac{\ln\left(S/K\right) + \left(r + s^2/2\right)t}{s\sqrt{t}}$$

$$d_2 = d_1 - s\sqrt{t}$$

Black-Scholes Model for option pricing

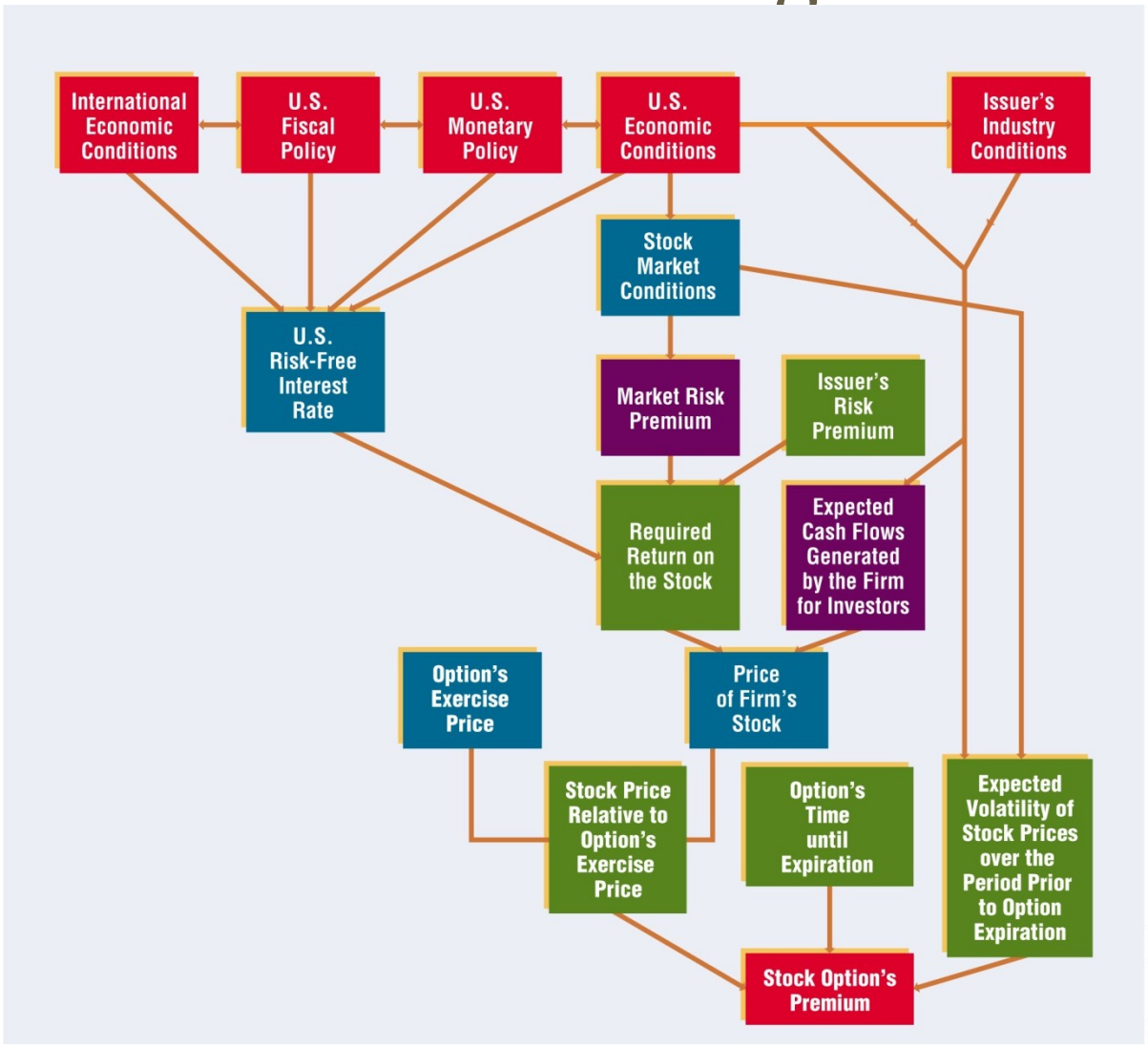


Explaining Changes in Option Premiums

- Economic conditions and market conditions can cause abrupt changes in the stock price or in the anticipated volatility of the stock price over the time until option expirations, leading to changes in the stock option's premium. (Exhibit 14.7)

  - **Indicators Monitored by Participants in the Options Market** Traders of options tend to monitor economic indicators because economic conditions affect cash flows of firms and thus can affect expected stock valuations and stock option premiums

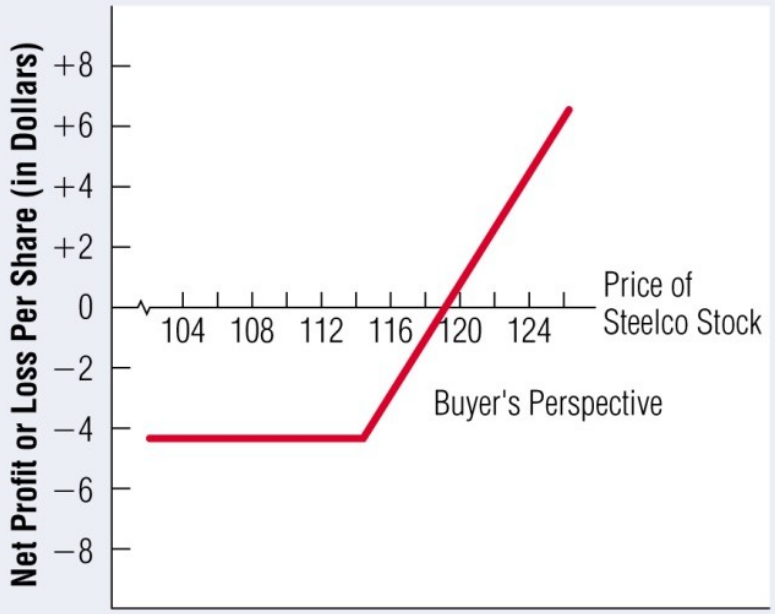
Framework for Explaining Why a Stock Option's Premium Changes over Time

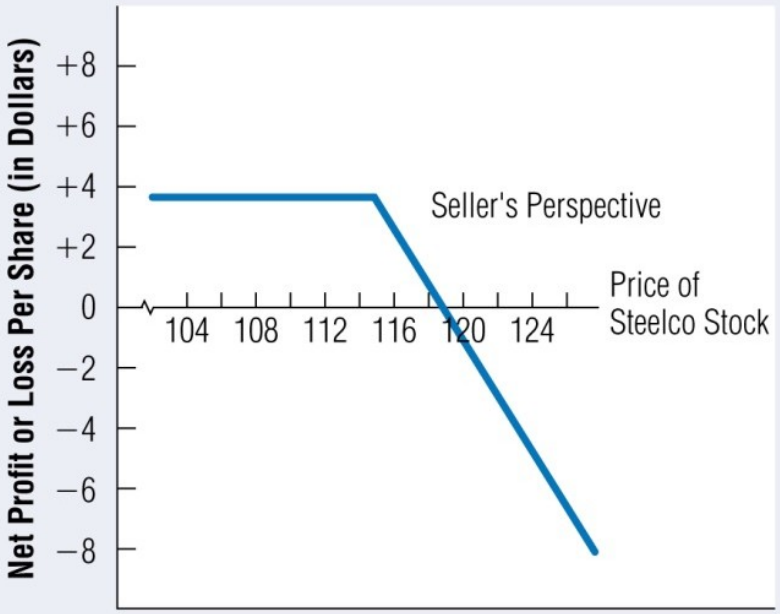


Speculating with Stock Options

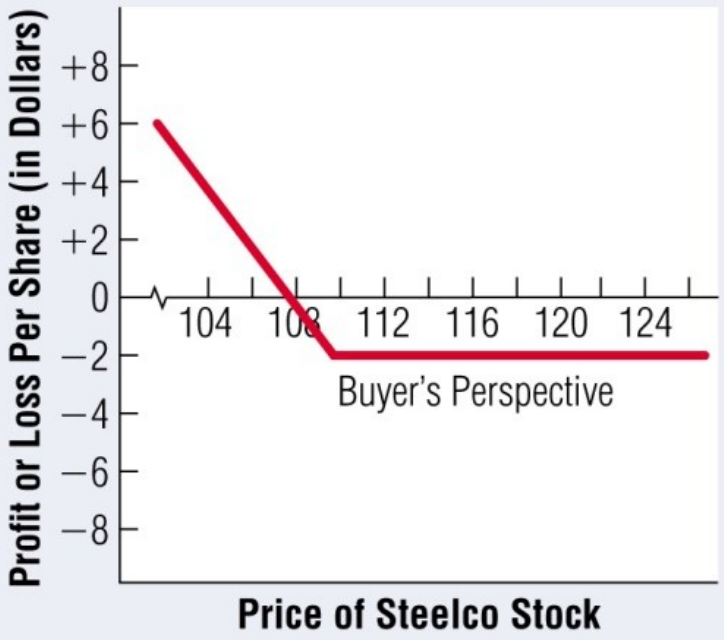
- Speculating with Call Options
  - Call options can be used to speculate on the expectation of an increase in the price of the underlying stock.
  - See Exhibits 14.8 – 14.11.
- Speculating with Put Options
  - Put options can be used to speculate on the expectation of a decrease in the price of the underlying stock.
  - See Exhibits 14.12.

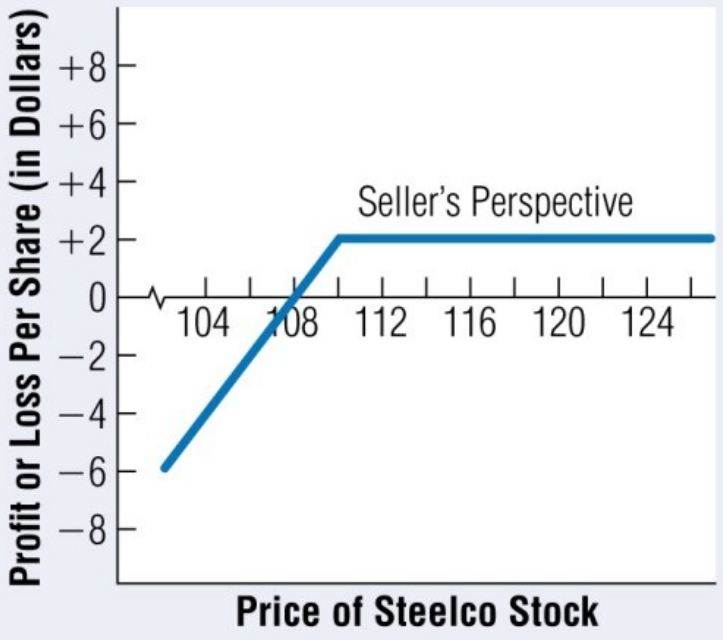
Potential Gains or Losses on a Call Option: Exercise Price = $115, Premium = $4





Potential Gains or Losses on a Put Option: Exercise Price = $110, Premium = $2





Option versus Stock Investments

- Purchasing call option
  - Bullish strategy
  - Profit when stock prices are increase
- Writing call option
  - Bearish strategy
  - Profit when stock prices are decrease
- Purchasing put option
  - Bearish strategy
  - Writing put option
- Bullish strategy
  - Because option values depend on the price of the underlying stock, purchase of options may be viewed as a substitute to direct purchase or sale of a stock

Option versus Stock Investments

Investment	Strategy Investment		
Equity only	**Buy stock @ 100**	**100 shares**	
	$10,000		
Options only	**Buy calls @ 10**	**1000 options**	
	$10,000		
Call +T- bills	**Buy calls @ 10**	**100 options**	**$1,000**
Buy T-bills @ 3% Yield			**$9,000**

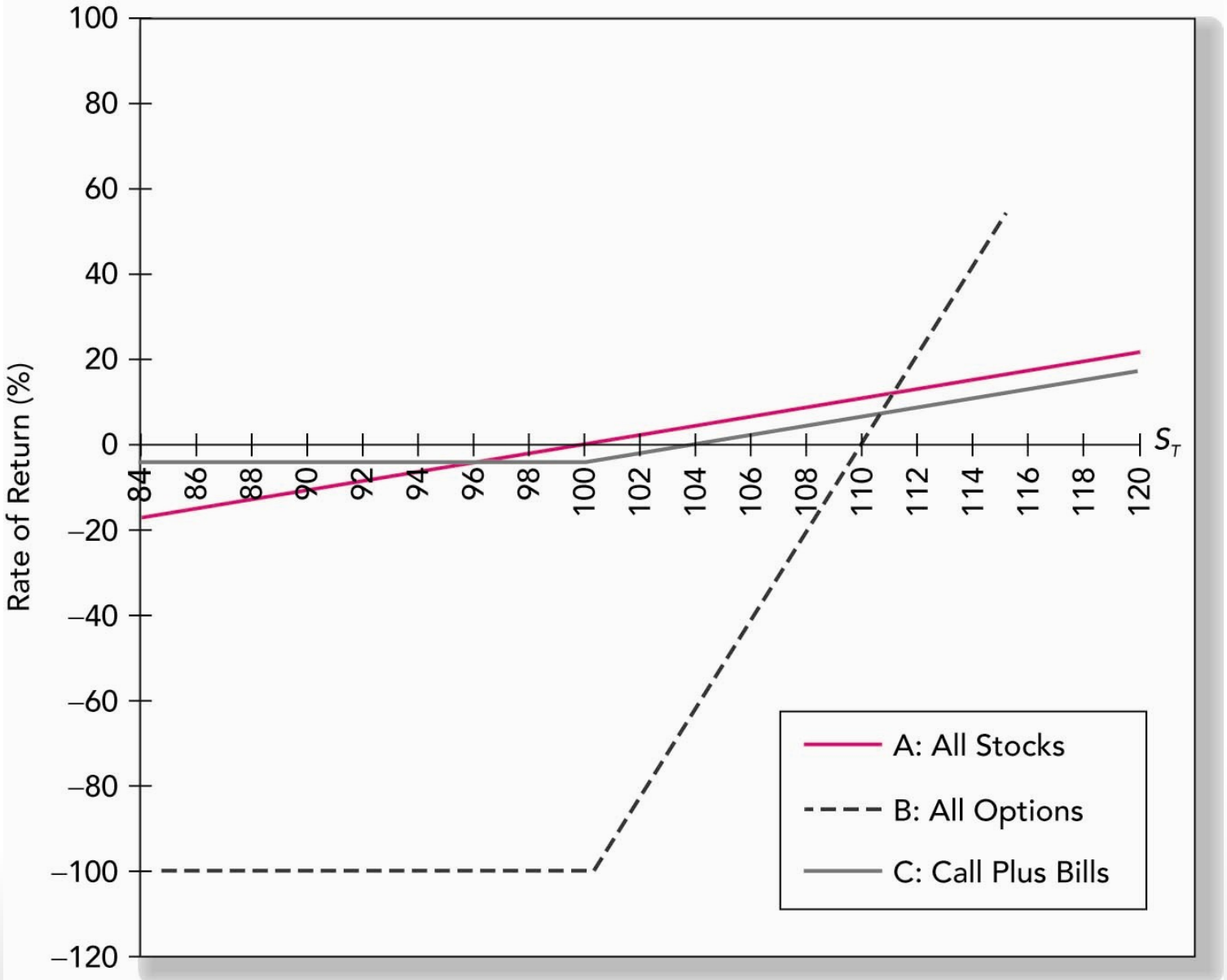
Option versus Stock Investments

	IBM Stock Price		
	$95	**$105**	**$115**
All Stock	**$9,500**	**$10,500**	**$11,500**
All Options	**$0**	**$5,000**	**$15,000**
Call + T-bills	**$9,270**	**$9,770**	**$10,770**

IBM Stock Price

	$95	$105	$115
All Stock	-5.0%	5.0%	15%
All Options	-100%	-50%	50%
Call + T- bills	-7.3%	-2.3%	7.7%

Rate of Return to Three



Hedging – Covered Call

- The purchase of a share of stock with a simultaneous sale of a call on the stock
  - The call is covered because the potential obligation to deliver the stock is covered by the stock held in the portfolio

TABLE 20.2

Value of covered call position at option expiration

	$S_T \leq X$	$S_T > X$
Payoff of stock	S_T	S_T
+ Payoff of written call	-0	$-(S_T - X)$
= *TOTAL*	S_T	X

Hedging - Protective Put

- Investing in a stock but with unwillingness to bear potential losses beyond some given level
  - Investing in stock with purchasing a put option on stock

TABLE 20.1

Value of protective put portfolio at option expiration

	$S_T \leq X$	$S_T > X$
Stock	S_T	S_T
+ Put	$X - S_T$	0
= *TOTAL*	X	S_T

Hedging - Straddle

- A long straddle buying both a call and a put on a stock with the same exercise price
- For investors who expect move a lot in price but are not certain about direction of the move
- The worst scenario for straddle is no movement in the stock price

	$S_T < X$	$S_T \geq X$
Payoff of call	0	$S_T - X$
+ Payoff of put	$X - S_T$	0
= *TOTAL*	$X - S_T$	$S_T - X$

TABLE 20.3

Value of a straddle position at option expiration