Chapter 15

Options Markets (Cont'd)

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“GM Stock's High Profile, Volatility Make Options a Prize”

(WSJ. Nov. 19, 2010)

GM CEO Daniel Akerson in a Chevy Camaro outside the NYSE.

Option Terminology

5. Symbols & Valuation

C_t =Price paid for a call option at time t. t = 0 is today,

T = Immediately before the option's expiration.

P_t = Price paid for a put option at time t.

S_t = Stock price at time t.

X = Exercise or Strike Price

A call is "in the money" if S_t ___>___ X.

A call is "out of the money" if S_t ____<____ X.

A put is "in the money" if S_t ____<____ X.

A put is "out of the money" if S_t ____>____ X.

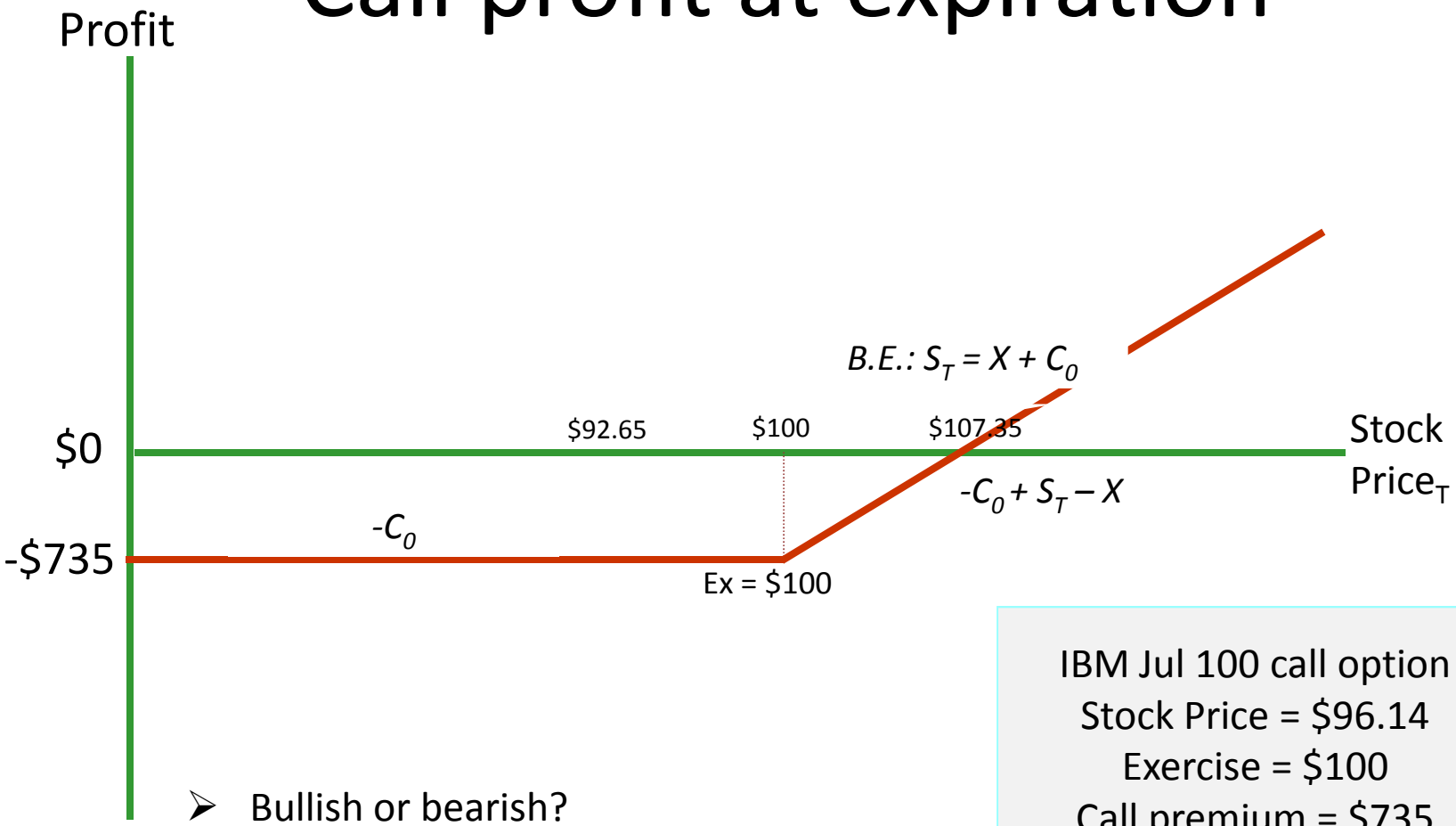
Both are "at the money" when?

Profit at expiration from buying a call option

7. Option strategies and profits at expiration

BUYING A CALL		
Profit Table	$S_T < X$	$S_T > X$
$-C_0$	$-C_0$	$-C_0$
$+C_T$	0	$S_T - X$
= Profit	$-C_0$	$-C_0 + S_T - X$
Breakeven		$S_T = X + C_0$

Call profit at expiration



- Bullish or bearish?
- High or low volatility strategy?

IBM Jul 100 call option
Stock Price = $96.14
Exercise = $100
Call premium = $735
Contract Size 100 shares

Leverage & Insurance Value of Options

	Stock Price					
Portfolio	**$85**	**$90**	**$95**	**$100**	**$105**	**$110**
A: 100 shares stock	$8,500	$9,000	$9,500	$10,000	$10,500	$11,000
B: 900 call options	0	0	4,500	9,000	13,500	18,000
C: 100 calls plus $8,000 in T-bills	8,160	8,160	8,660	9,160	9,660	10,160

6 months maturity call is exercise price of $90 sells for $10 and the semiannual interest rate is 2%. Have total of $9,000 to invest.

A: Invest entirely in stock (buy 100 shares of stock)
B: Invest entirely in options (buy 900 calls)
C: Purchase 100 calls and invest remainder in T-Bills

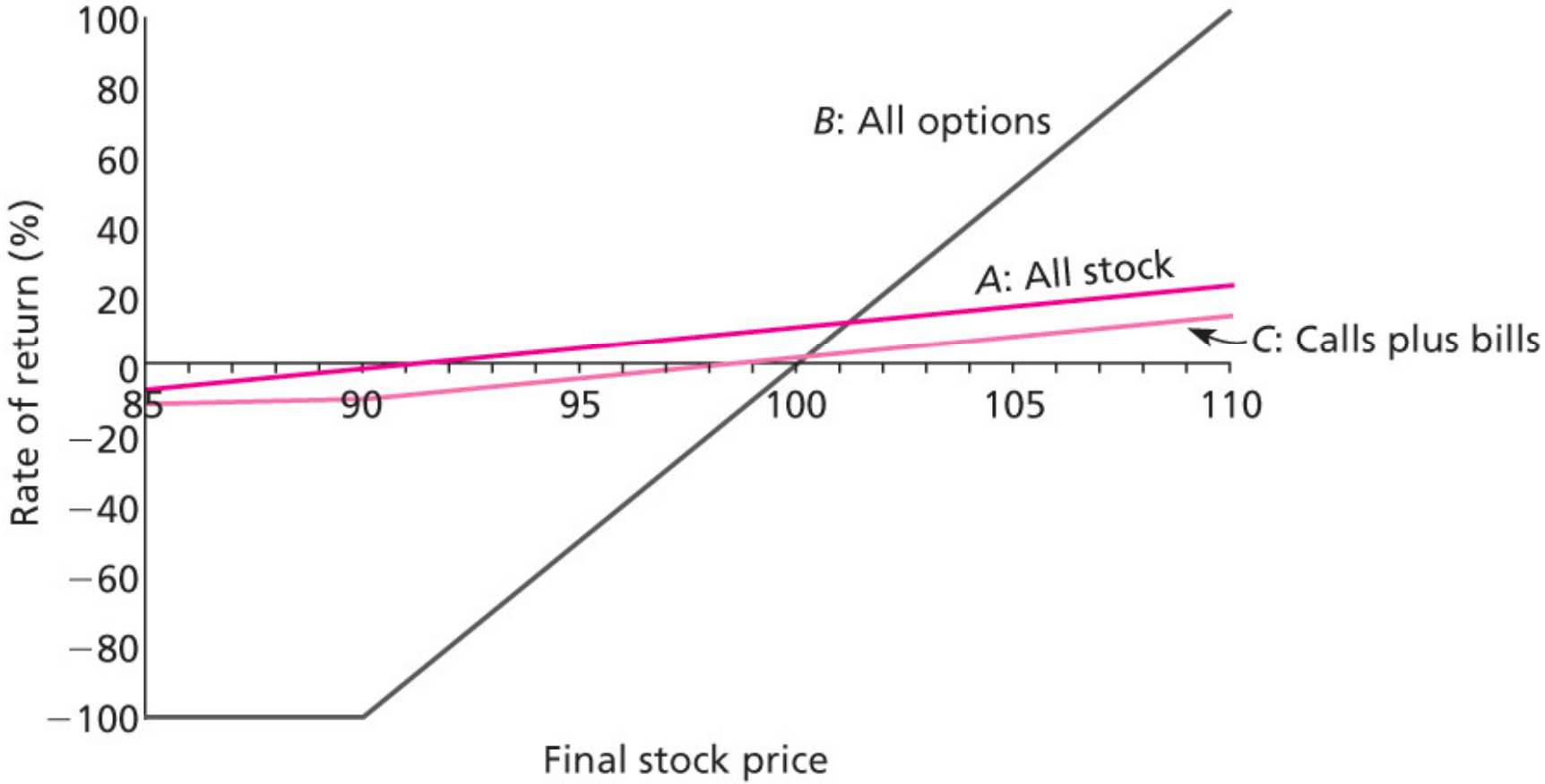
Leverage & Insurance Value of Options

	Stock Price					
Portfolio	**$85**	**$90**	**$95**	**$100**	**$105**	**$110**
A: 100 shares stock	−5.56%	0.0%	5.56%	11.11%	16.67%	22.22%
B: 900 call options	−100.0	−100.0	−50.00	0.0	50.0	100.0
C: 100 calls plus $8,000 in T-bills	−9.33	−9.33	−3.78	1.78	7.33	12.89

6 months maturity call is exercise price of $90 sells for $10 and the semiannual interest rate is 2%. Have total of $9,000 to invest.

A: Invest entirely in stock (buy 100 shares of stock)
B: Invest entirely in options (buy 900 calls)
C: Purchase 100 calls and invest remainder in T-Bills

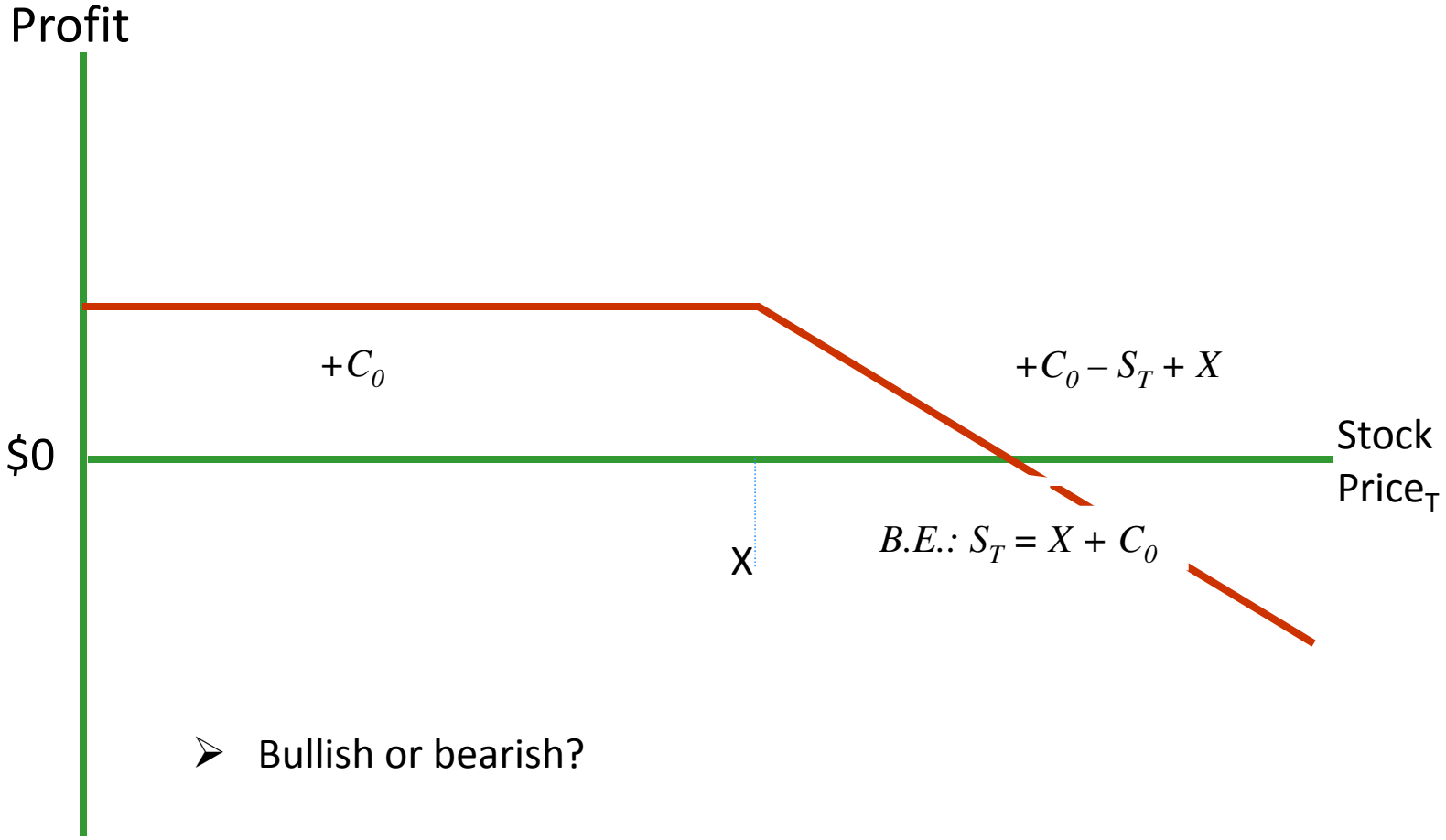
Leverage & Insurance Value of Options



Writing a naked call

WRITING A NAKED CALL		
Profit Table	$S_T < X$	$S_T > X$
$+C_0$	$+C_0$	$+C_0$
$-C_T$	0	$-(S_T - X)$
= Profit	$+C_0$	$+C_0 - S_T + X$
Breakeven		$S_T = X + C_0$

Writing a naked call



- Bullish or bearish?
- High or low volatility strategy?

Buying a put option

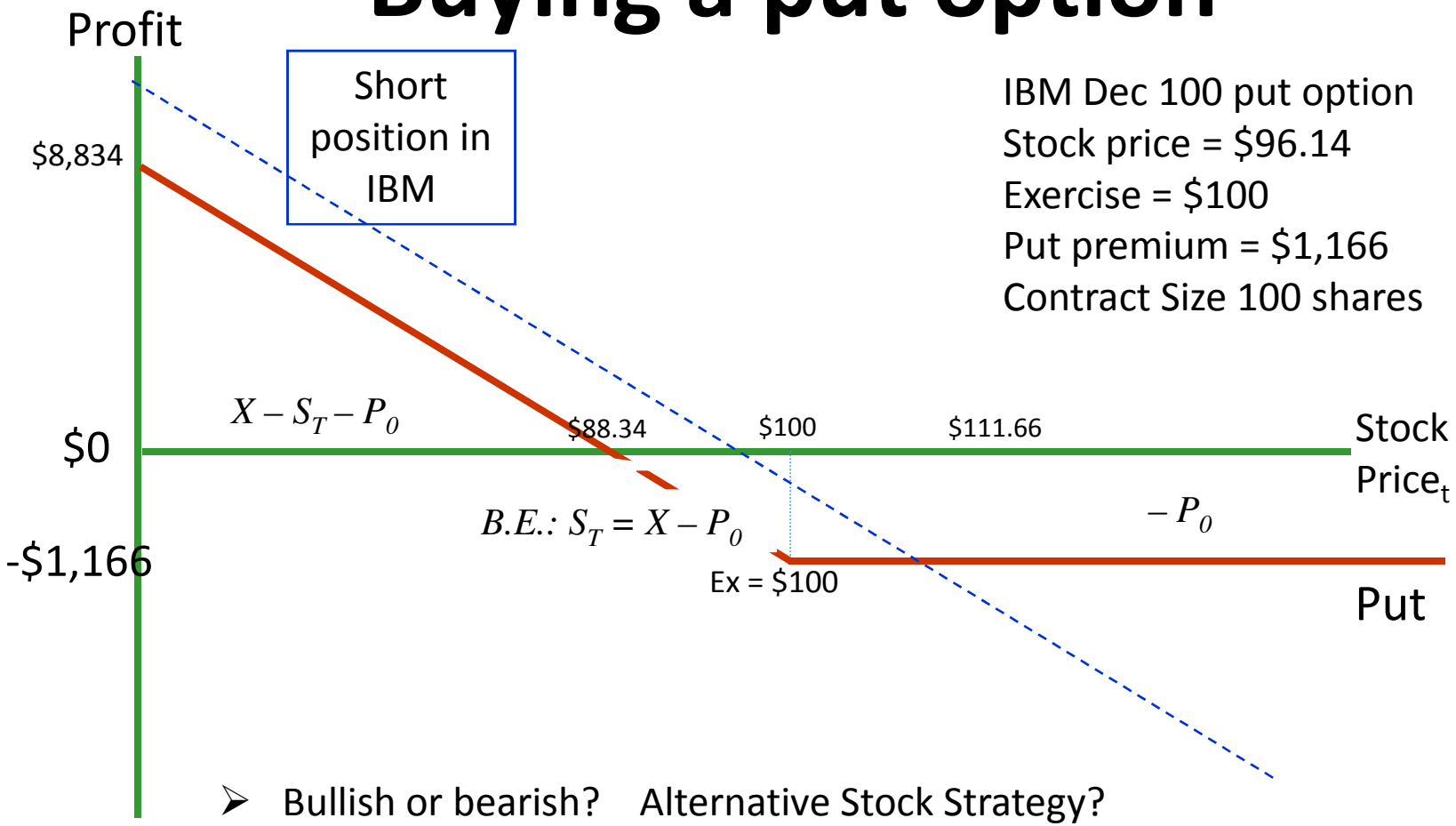
BUYING A PUT		
Profit Table	$S_T < X$	$S_T > X$
$-P_0$	$-P_0$	$-P_0$
$+P_T$	$X - S_T$	0
= Profit	$X - S_T - P_0$	$-P_0$
Breakeven	$S_T = X - P_0$	

IBM Option Quotes

Prices at close February 06, 2009

IBM (IBM)					Underlying stock price: 96.14		
		Call			Put		
Expiration	Strike	Last	Volume	Open Interest	Last	Volume	Open Interest
Feb	90	6.83	2501	17389	0.80	2504	9336
Mar	90	8.70	699	6764	2.60	1491	5072
Apr	90	9.96	101	8095	3.70	568	11298
Jul	90	13.44	994	5638	7.03	176	4066
Feb	95	3.20	6342	14541	2.25	2981	2749
Mar	95	5.30	1182	5319	4.28	918	3701
Apr	95	6.75	561	20533	5.63	779	8058
Jul	95	9.80	141	4628	9.00	81	620
Feb	100	1.00	7929	12437	4.90	782	599
Mar	100	2.80	3946	10965	6.47	1206	238
Apr	100	4.10	1517	8839	7.83	90	2385
Jul	100	7.35	115	4039	11.66	25	461

Buying a put option

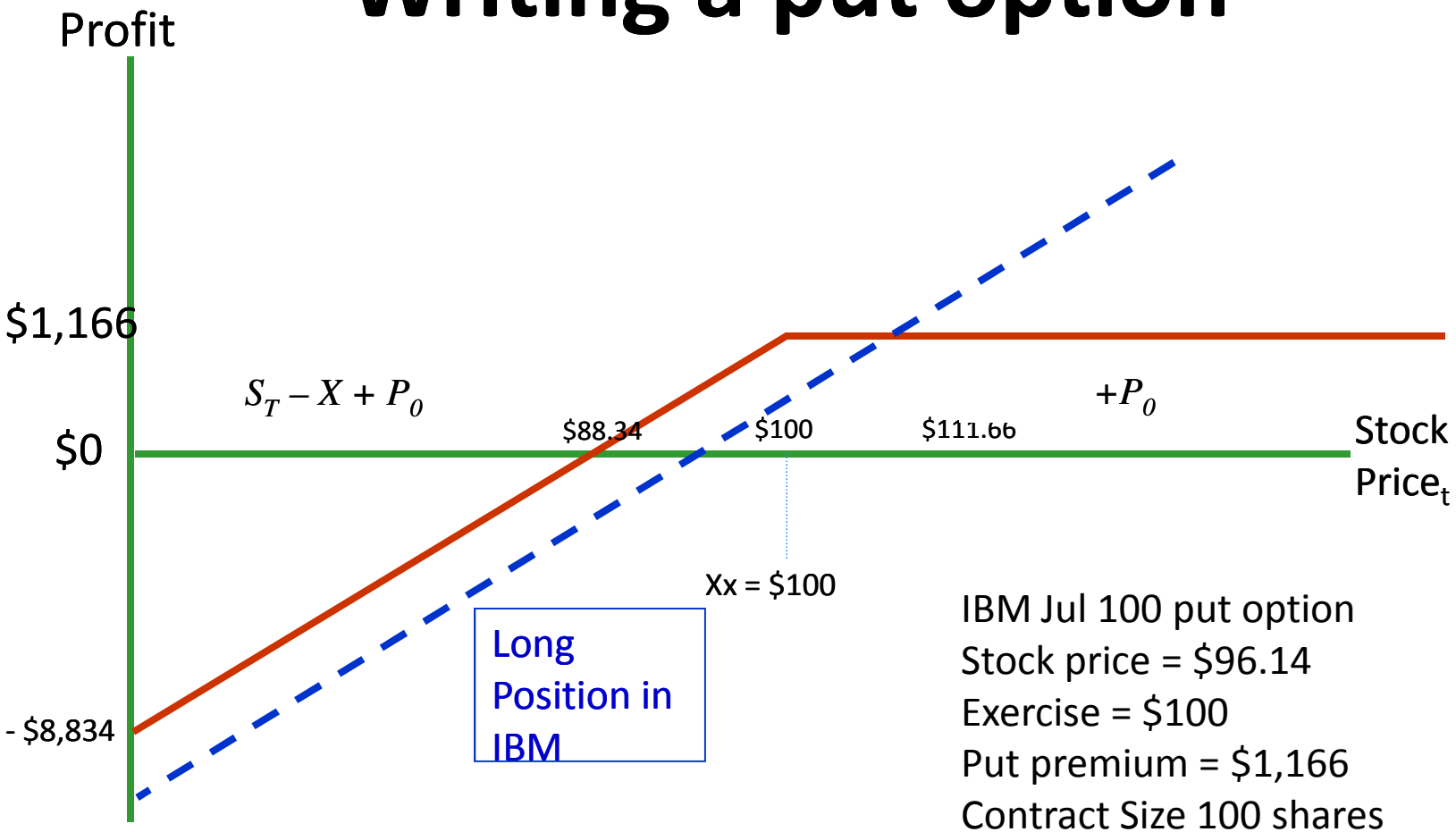


- Bullish or bearish? Alternative Stock Strategy?
- High or low volatility strategy?

Writing a put option

Writing A Put		
Profit Table	$S_T < X$	$S_T > X$
$+P_0$	$+P_0$	$+P_0$
$-P_T$	$-(X - S_T)$	0
= Profit	$S_T - X + P_0$	$+P_0$
Breakeven	$S_T = X - P_0$	

Writing a put option



IBM Jul 100 put option
Stock price = $96.14
Exercise = $100
Put premium = $1,166
Contract Size 100 shares

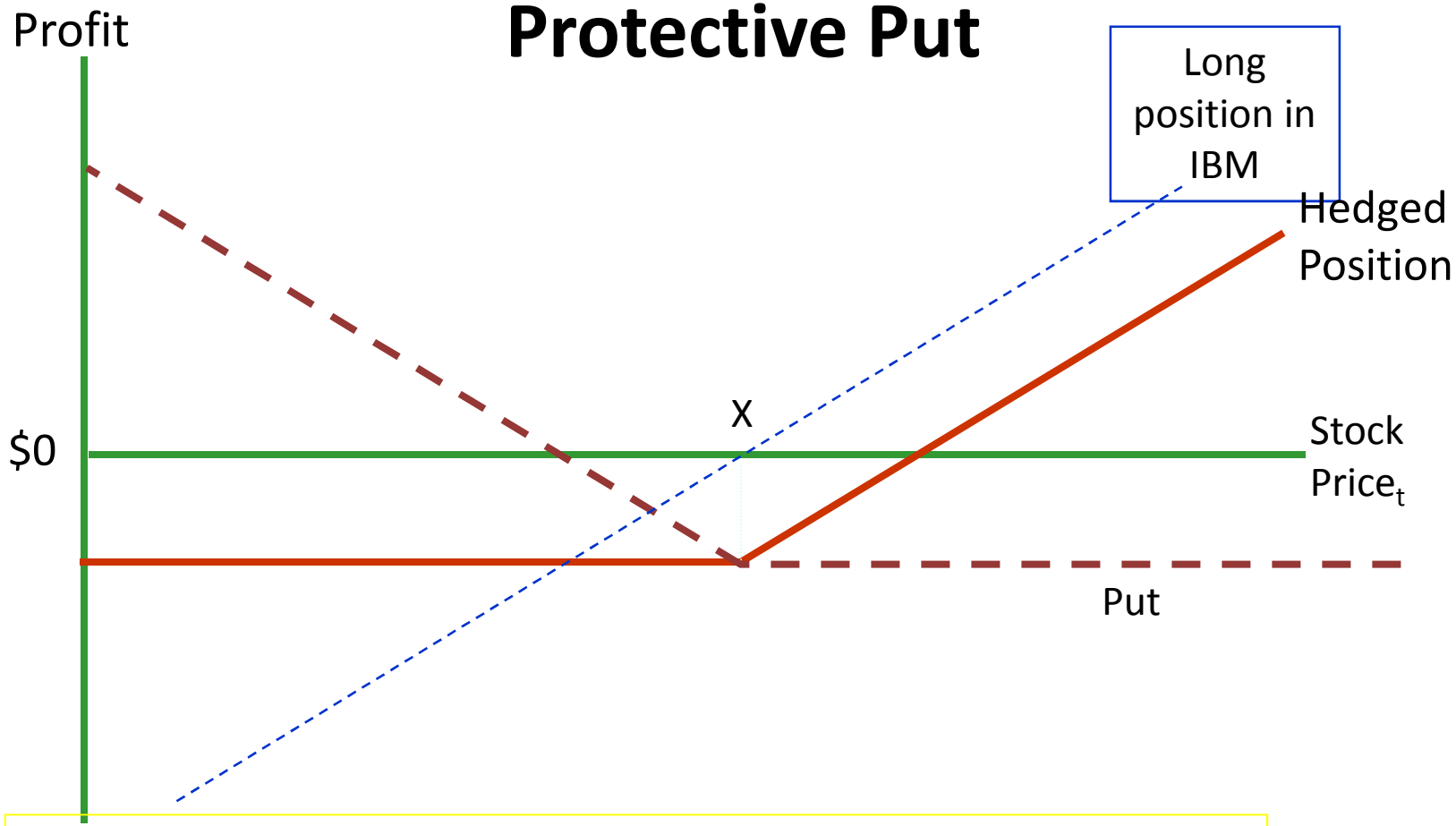
- Bullish or bearish? Alternative Stock Strategy?
- High or low volatility strategy?

Buy stocks and at the money puts: Protective Put

- All examples that include both stocks and options assume usage of at the money options.

Portfolio Insurance

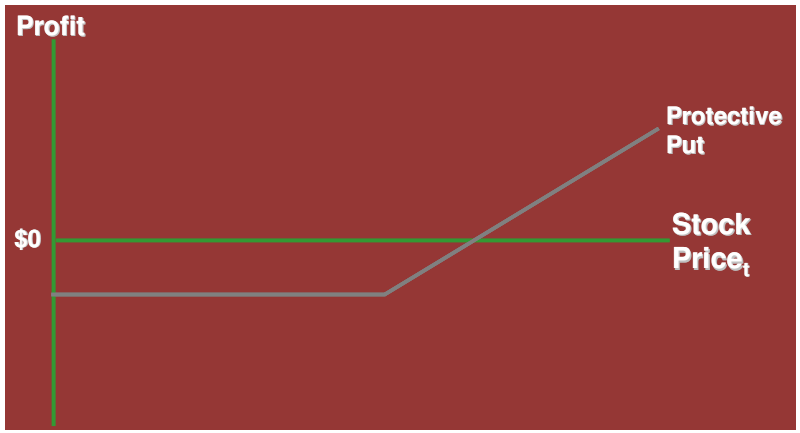
Buy stocks and at the money puts: Protective Put



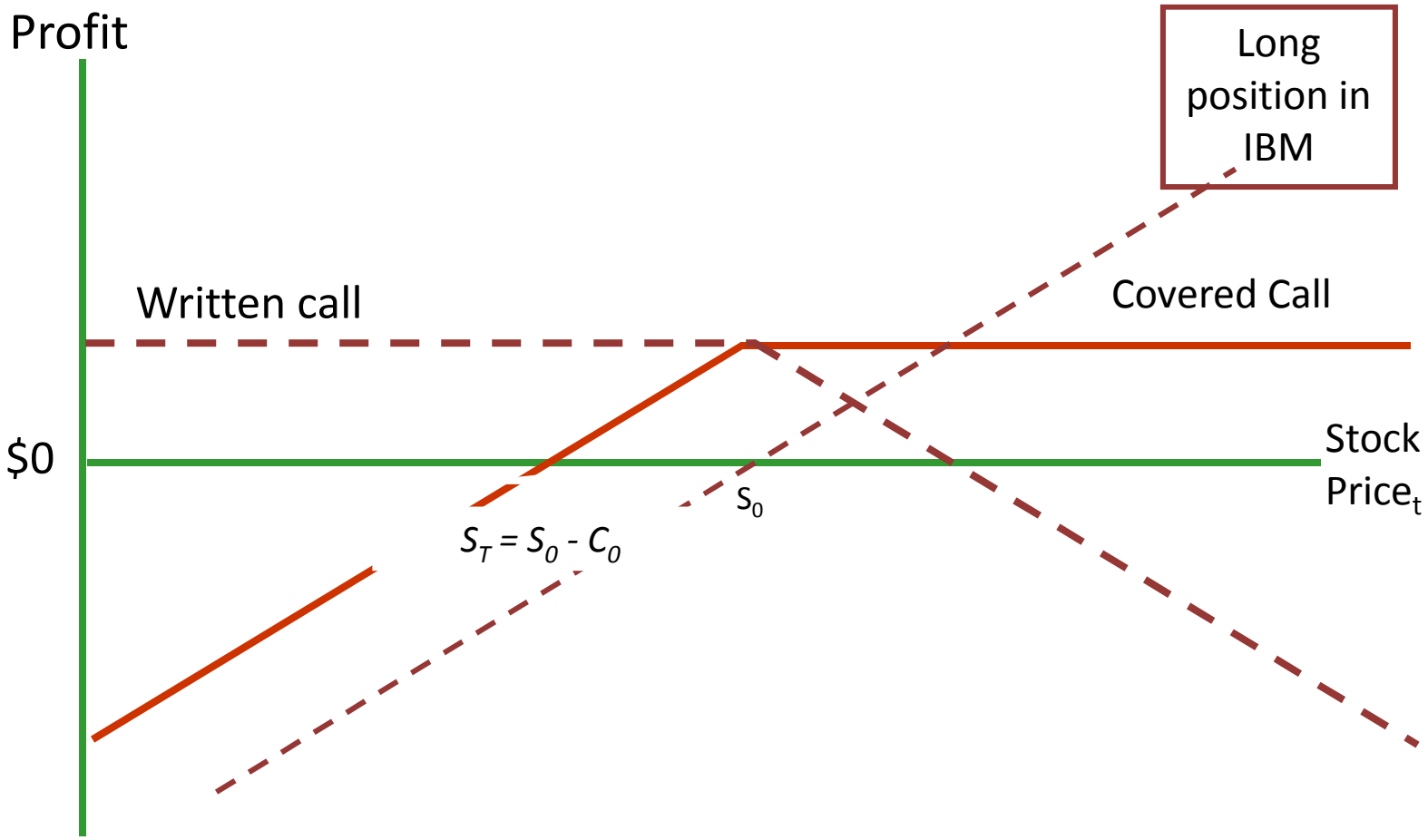
Hedged profit equals sum of profits of put and stock at each stock price.

Buy stocks and at the money puts: Protective Put

LONG STOCK, LONG PUT		
Profit Table	$S_T < X$	$S_T > X$
$S_T - S_0$	$S_T - S_0$	$S_T - S_0$
$-P_0$	$-P_0$	$-P_0$
$+P_T$	$X - S_T$	0
= Profit	$S_T - S_0 + X - S_T - P_0$ $= X - S_0 - P_0$	$S_T - S_0 - P_0$
Breakeven		$S_T = S_0 + P_0$



Writing Covered Calls



- Bullish or bearish?
- High or low volatility strategy?

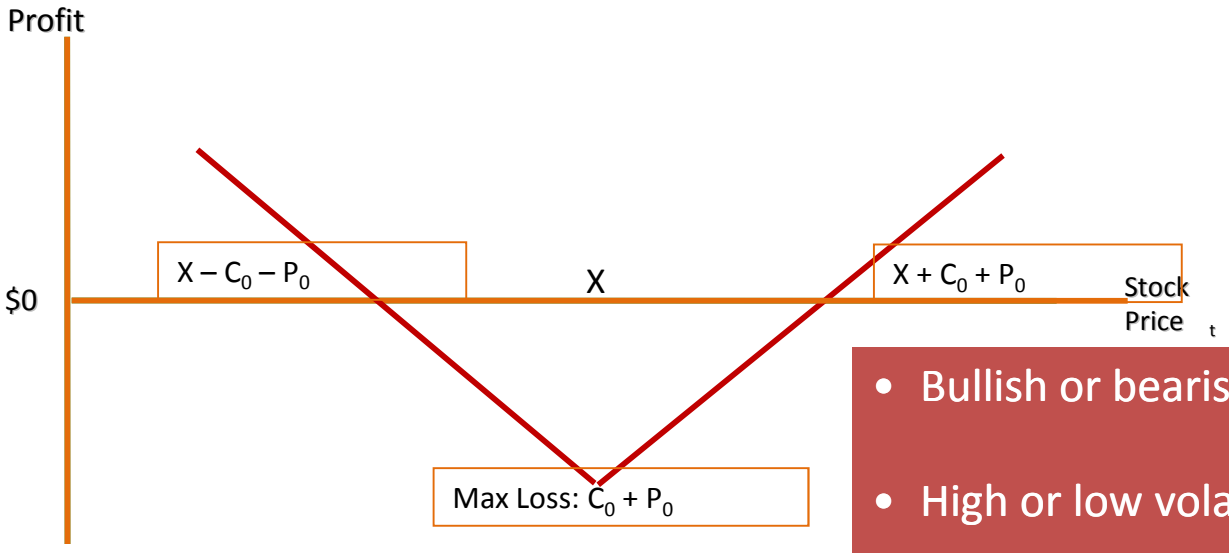
Long or Bull Straddle

Long or bull straddle: buy a put and a call with the same T and X.

(For bear or short straddle, sell both put and call and just flip the graph upside down.)

Long or Bull Straddle

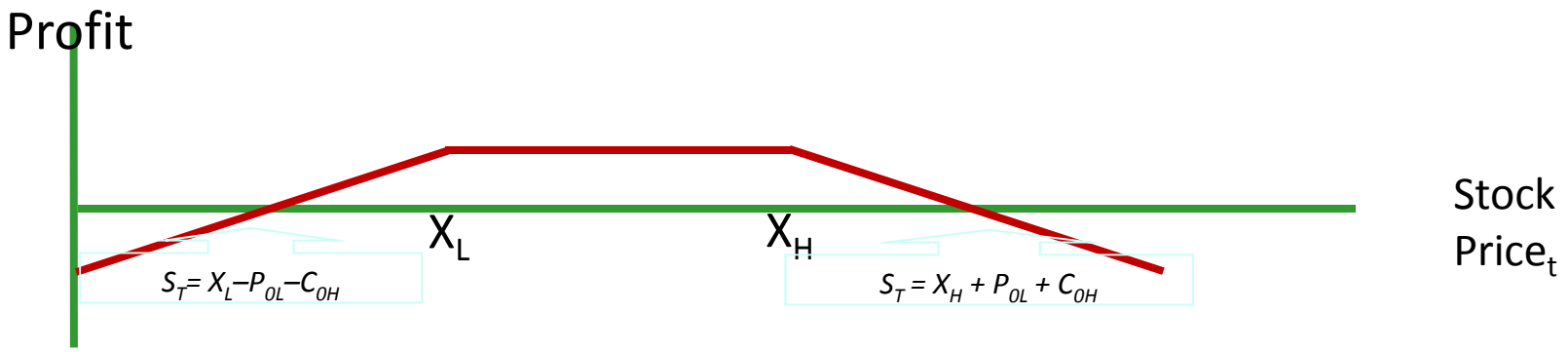
BULL STRADDLE		
Profit Table	$S_T < X$	$S_T > X$
$-C_0$	$-C_0$	$-C_0$
$-P_0$	$-P_0$	$-P_0$
$+C_T$	0	$S_T - X$
$+P_T$	$X - S_T$	0
= Profit	$X - S_T - C_0 - P_0$	$S_T - X - C_0 - P_0$
Breakeven	$S_T = X - C_0 - P_0$	$S_T = X + C_0 + P_0$



- Bullish or bearish? Neutral
- High or low volatility strategy?

Short Strangle: Sell out of the money put and call

Short Strangle			
Profit Table	$S_T < X_L$	$X_L < S_T < X_H$	$S_T > X_H$
$+ P_{0L}$	$+ P_{0L}$	$+ P_{0L}$	$+ P_{0L}$
$+C_{0H}$	$+C_{0H}$	$+C_{0H}$	$+C_{0H}$
$- P_{TL}$	$-(X_L - S_T)$	0	0
$- C_{TH}$	0	0	$-(S_T - X_H)$
= Profit	$S_T - X_L + P_{0L} + C_{0H}$	$P_{0L} + C_{0H}$	$X_H - S_T + P_{0L} + C_{0H}$
Breakeven	$S_T = X_L - P_{0L} - C_{0H}$	+	$S_T = X_H + P_{0L} + C_{0H}$

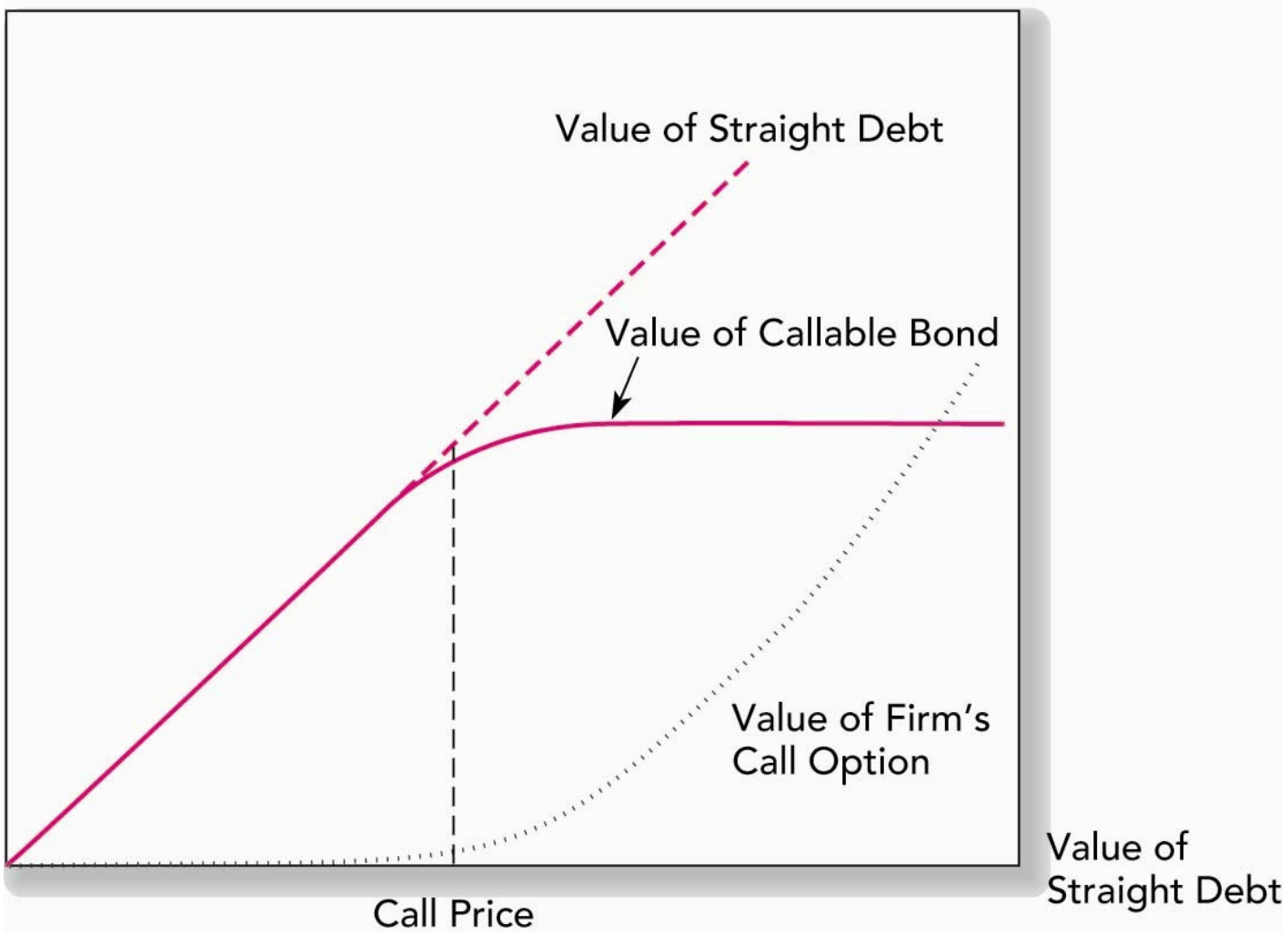


15.3 Optionlike Securities

Optionlike Securities

1. Callable bonds
   - Issuing firm has the right to call in the bond and pay call price.
   - When will the firm want to exercise its call option?

Figure 14.12 Values of Callable Bonds Compared with Straight Bonds

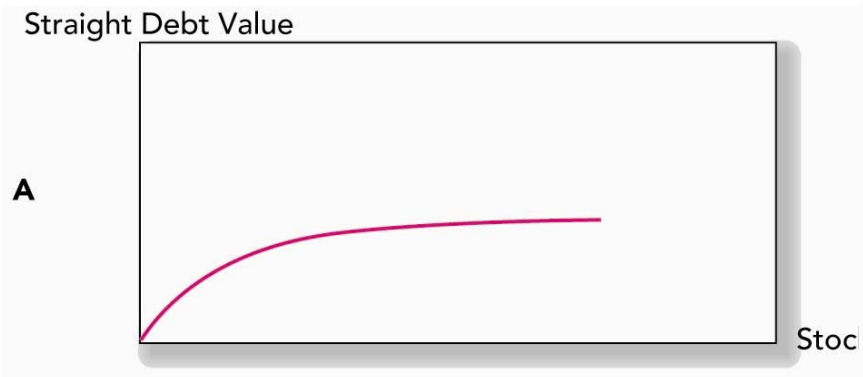


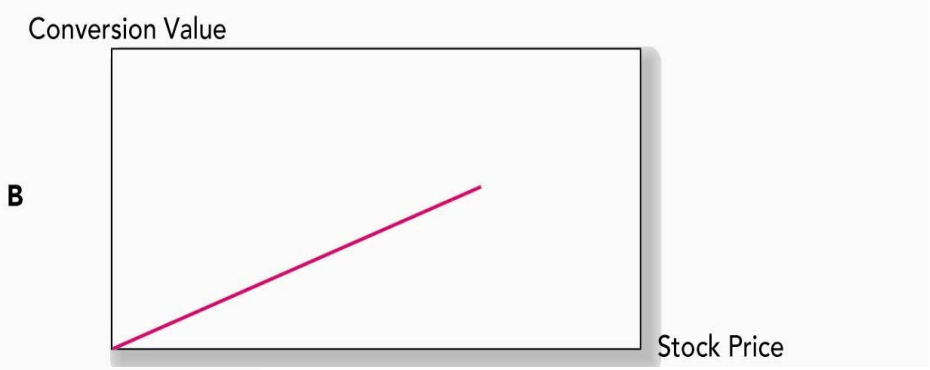
Optionlike Securities

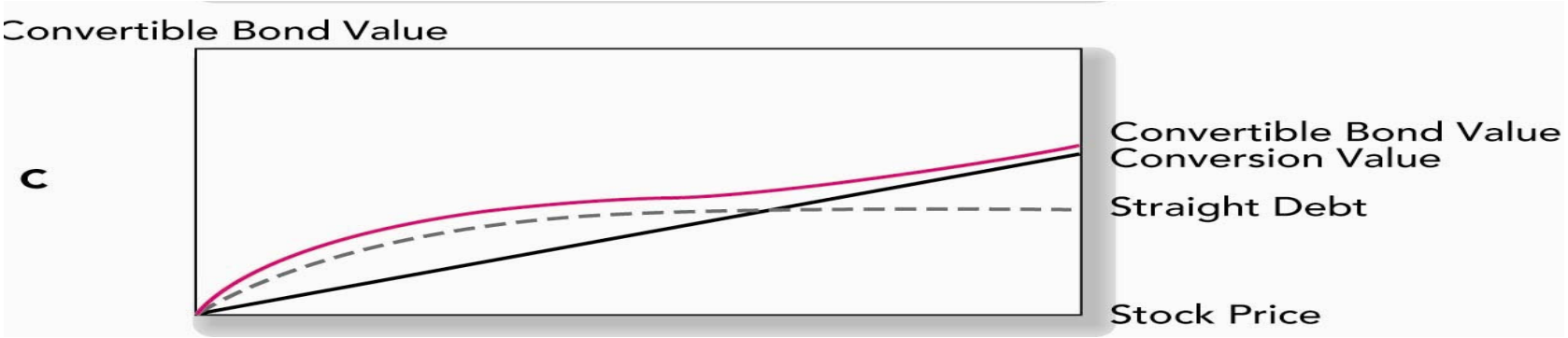
2. Convertible Securities

- Security holder has the option to convert the bond to a fixed number of shares of common stock.
  - Bond's Conversion Value = Conversion Ratio x Common Stock Price
  - If a bond is convertible to 20 shares of stock, stock is priced at $60 per share. The bond's conversion value = $1,200

Value of Convertible Bond as a Function of Stock Price







The option is issued deep out the money, the 'option cost' is a lower coupon.

Optionlike Securities

3. Warrants
   - Firm sometimes issue warrants with its bonds. The warrants are call options to purchase new stock at a fixed price.
   - Detachable “sweetener” to help sell the bond
   - Exercise of warrants (and convertibles) can result in dilution of earnings per share

Optionlike Securities

4. **Collateralized loans**
   - **Suppose a borrower is obligated to pay back L dollars at loan maturity (Time T) and has posted collateral worth S_t dollars.**
   - **The borrower has an option to repay the loan at maturity if $L > S_T$, otherwise the borrower can default and give up the value of L.**

5. **A similar logic applies to corporate equity if a firm has debt.**
   - **Equity holders effectively have a call option on firm value as they can choose to pay off the debt if firm value > value of the debt or default otherwise.**

Exotic Options

- **Asian Options** — Payoff depends on the average (rather than the final) price of the underlying asset during a portion of the life of the option.
- **Barrier Options** — Example “down-and-out” expires worthless if the stock price drops below a specified barrier.
- **Lookback Options** — Payoff depends on minimum or max price during life of option.

Exotic Options

❖Currency Translated Options or Quantos

Allows a variable amount of foreign currency based on the performance of an investment to be translated to dollars at a fixed exchange rate.

❖Binary or Digital Options

Pays a fixed amount if the option is in the money at expiration.