LECTURE 7

Options (Chapter 15)

DERIVATIVE MARKETS

Derive" from Derivatives – investments derived from prices of other securities – Contingent claim because their payoffs come from prices of other securities.

USE both for Hedging and Speculation

- Options
- Futures
- Swaps

Buying an Option on a House Example:
Thinking on buying a house that is listed for $100,000. If you like the price you must lock in. But you need more time to look at other houses, so you approach the owner and sign an agreement with option to buy at $100,000 within 2 months and pay for that option (let's say 2.0% or $2,000). YOU HAVE THE RIGHT TO BUY NOT THE OBLIGATION.

OPTIONS

Few headlines:
AIG Loses - $100 Billion - Massive Government Bailout (Sep 08)
Goldman Sachs / Paulson & Co Hedge Fund

USE OPTIONS FOR INSURANCE / PROTECTING / HEDGING – RESPONIBLE RISK MANAGER

CALL OPTIONS

The right to purchase an asset for a specific price (exercise price or strike price) on or before some specified expiration

i.e. March Call OPTION for IBM stock with exercise price of $100 entitles its owner to **PURCHASE** IBM stock for $100 at any time up to and including the expiration S=Day in March (third Friday). The purchase price option is called **PREMIUM** (like insurance) - the seller that owns the stock receives the premium

EXAMPLE 15.1 – Call 3/20 third Friday of the Month (MARCH 2010) Call option IBM $100 with Premium for $2.80

Until March 20, the holder of the option may buy the stock (10 shares per option) for $100. On February 6, IBM sells for $96.14 – Not a good time to exercise – If IBM is selling at $102 on

March 20 – The option will be exercised (even though you will loose money – but not as much as not exercising)

102 – Buy 100 = $2

Profit = Final Value – Original Investment = 2- 2.80 = -.80

BASIC OPTION STRATEGIES

		Calls			Puts		
4	X	July	Aug	Oct	July	Aug	Oct
5	165	$ 2.50	$ 5.00	$ 7.90	$ 2.15	$ 4.65	$ 6.50
6	170	$ 0.75	$ 3.15	$ 5.65	$ 5.60	$ 7.10	$ 8.75
7							
8	Current Price						
9	$ 165.13						

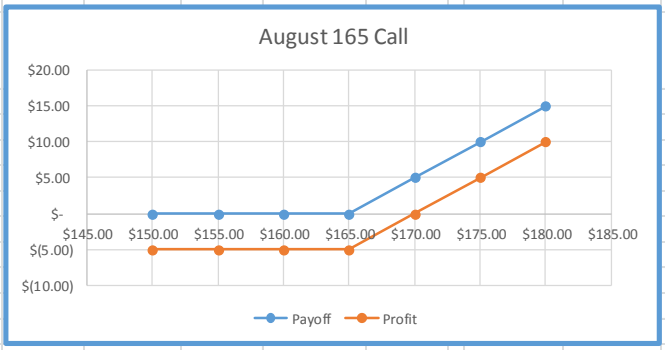
UNCOVERED (NAKED) OPTION STRATEGIES

Example 1 (Buying a Call Option)

S_0 = $ 165.13
X = $ 165.00
Purchase C = $ 5.00 (August)

Stock Price (S)	Exercise Price (X)	Payoff (S - X)	Profit (π)	HPR (%)
$ 150.00	$ 165.00	$ -	$ (5.00)	-100%
$ 155.00	$ 165.00	$ -	$ (5.00)	-100%
$ 160.00	$ 165.00	$ -	$ (5.00)	-100%
$ 165.00	$ 165.00	$ -	$ (5.00)	-100%
$ 170.00	$ 165.00	$ 5.00	$ -	0%
$ 175.00	$ 165.00	$ 10.00	$ 5.00	100%
$ 180.00	$ 165.00	$ 15.00	$ 10.00	200%

Break Even = $ 170.00 Stock Price
Max Loss= $ (5.00) per share



PUT OPTIONS

Gives the holder the right to SELL an Asset for a specific exercise or stock price on or before a specific date (exercise date)

i.e. MARCH $100 - Sell IBM at $100 even if the stock price less than $100 – The owner of the PUT option does not need to own the shares to exercise the option

Example 15.2 PUT

PUT OPTION w/ exercise price $100 sell on 2/6/10 for $6.47. Entitles the owner of the option to sell IBM shares at any time, until March 20, to sell the stock at $100

If price on 2/6/10 is $96.14 – an immediate exercise will loose money – wait until the expiration date March 20 – If March 20, the price of the IBM stock is $92, then you exercise the option – buying the stock at $100 and sell it at $92

100 – 92 = $8 gross profit
$8 – 6.47 = $1.53 -----net profit of HPR of 1.53/6.47 = 23.6%

American Option (on or before) / European Option (on expiration day)

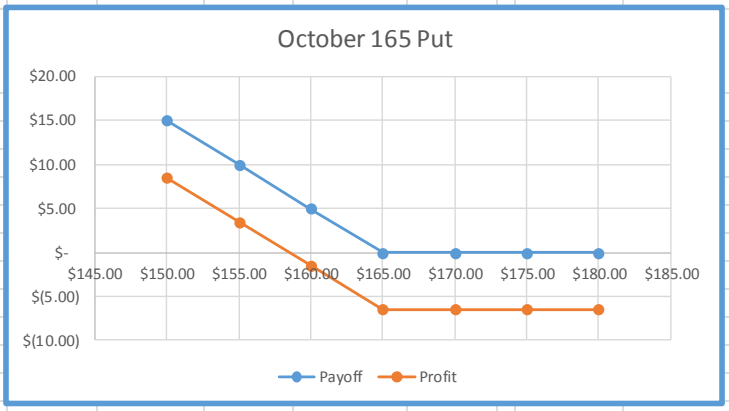
			Calls			Puts		
4	X		July	Aug	Oct	July	Aug	Oct
5	165		$ 2.50	$ 5.00	$ 7.90	$ 2.15	$ 4.65	$ 6.50
6	170		$ 0.75	$ 3.15	$ 5.65	$ 5.60	$ 7.10	$ 8.75
7								
8	Current Price							
9	$ 165.13							

Example 2 (Buying a Put Option)

	S_0 =	$ 165.13	
	X =	$ 165.00	
Purchase	P =	$ 6.50	(October)

Stock Price (S)	Exercise Price (X)	Payoff (X - S)	Profit (π)	HPR (%)
$ 150.00	$ 165.00	$ 15.00	$ 8.50	131%
$ 155.00	$ 165.00	$ 10.00	$ 3.50	54%
$ 160.00	$ 165.00	$ 5.00	$ (1.50)	-23%
$ 165.00	$ 165.00	$ -	$ (6.50)	-100%
$ 170.00	$ 165.00	$ -	$ (6.50)	-100%
$ 175.00	$ 165.00	$ -	$ (6.50)	-100%
$ 180.00	$ 165.00	$ -	$ (6.50)	-100%

	Break Even =	$ 158.50	Stock price
	Max Gain=	$ 158.50	per share
	Max Loss=	$ 6.50	per share



4 STATEGIES

	Buy a CALL	Write a CALL	Buy a PUT	Write a PUT
Expected Stock	UP	Stabilize / Sideways	DOWN	U or stable
Max Loss	Premium	Opportunity Cost	Premium	Exercise Price – Stock - Premium
		Must own the stock		

PROTECTIVE PUT

Hedging strategy

Investing in stock and purchasing a Put option on the stock

i.e. Suppose the strike price is $90 ans the stock is selling for $87 at expiration day – the value of your stock in your portfolio is $90. The right to sell the stock at $90 The stock is worth $87 – You sell it at the option price at $90 then your profit is

X – St = $90 - $87 = $3

if the price of the stock is S=90 = you get $90
if S = 94 then S>94 = the option at 90 is worthless, but you own the stock

Payoff to protective PUT strategy

	St <= X	**St > X**
Stock	St	St
Put Option	X – St	0
Total	X	St

Despite the common perception that Derivative means Risk – these can be used effectively for risk management – Brane Vs Roth – responsibility to hedge Grain held in storage – failed to hedge – lawsuit was one because manager failed to use to secure the risk by hedging.

EXAMPLE

Example 4 (Protective Puts)

Strategy: Owning or Buying the stock
Buying Put Options
Purpose: To protect your holdings of the stock for any declines

S_0 = $ 165.13
X = $ 170.00

Buy P = $ 8.75 (October) One contract = 100 shares
Purchased Shares= 100

		OPTIONS			STOCK		
Stock Price (S)	Exercise Price (X)	Uncovered Options Payoff (S - X)	Uncovered Options Profit (π)	Uncovered Options Profit (π) x 100	Proceeds from Stock	Profit from Stock	Total Profit from Protective Put
$ 150.00	$ 170.00	$ 20.00	$ 11.25	$ 1,125	$ 15,000	$ (1,513)	$ (388)
$ 155.00	$ 170.00	$ 15.00	$ 6.25	$ 625	$ 15,500	$ (1,013)	$ (388)
$ 160.00	$ 170.00	$ 10.00	$ 1.25	$ 125	$ 16,000	$ (513)	$ (388)
$ 165.00	$ 170.00	$ 5.00	$ (3.75)	$ (375)	$ 16,500	$ (13)	$ (388)
$ 170.00	$ 170.00	$ -	$ (8.75)	$ (875)	$ 17,000	$ 487	$ (388)
$ 175.00	$ 170.00	$ -	$ (8.75)	$ (875)	$ 17,500	$ 987	$ 112
$ 180.00	$ 170.00	$ -	$ (8.75)	$ (875)	$ 18,000	$ 1,487	$ 612
$ 185.00	$ 170.00	$ -	$ (8.75)	$ (875)	$ 18,500	$ 1,987	$ 1,112
$ 190.00	$ 170.00	$ -	$ (8.75)	$ (875)	$ 19,000	$ 2,487	$ 1,612

CF (0) $	Max Gain $	Max Gain Stock	Max Loss $	Max Loss Stock	BE on option	BE on Protective Put
$ (17,388)	Unlimited	Unlimited	$ (388)	$ (165.13)	$ 161.25	$ 173.88

COVERED CALLS

Is the purchase of Share of Stock with simultaneous sale of a Call on the stock. The option is "covered" because the potential obligation to deliver the stock is covered by the stock held in the portfolio.

NOTE: Writing an option without affecting the stock is called "naked option writing"

	St <= X	St > X
Payoff of Stock	St	St
Payoff of Call Option	- 0	-(St – X)
Total	St	X

EXAMPLE:

Example 5 (Covered Calls)

Strategy: Owning or Buying the stock
Selling (writing) Calls
Purpose: Intent to sell the stock in the future

S_0 = $ 165.13
X = $ 170.00

Sell C = $ 5.65 (October) One contract = 100 shares
Purchased Shares= 100

		OPTIONS			STOCK		
Stock Price (S)	Exercise Price (X)	Uncovered Options Payoff (X - S)	Uncovered Options Profit (π)	Uncovered Options Profit (π) x 100	Proceeds from Stock	Profit from Stock	Total Profit from Covered Call
$ 150.00	$ 170.00	$ -	$ 5.65	$ 565	$ 15,000	$ (1,513)	$ (948)
$ 155.00	$ 170.00	$ -	$ 5.65	$ 565	$ 15,500	$ (1,013)	$ (448)
$ 160.00	$ 170.00	$ -	$ 5.65	$ 565	$ 16,000	$ (513)	$ 52
$ 165.00	$ 170.00	$ -	$ 5.65	$ 565	$ 16,500	$ (13)	$ 552
$ 170.00	$ 170.00	$ -	$ 5.65	$ 565	$ 17,000	$ 487	$ 1,052
$ 175.00	$ 170.00	$ (5.00)	$ 0.65	$ 65	$ 17,500	$ 987	$ 1,052
$ 180.00	$ 170.00	$ (10.00)	$ (4.35)	$ (435)	$ 18,000	$ 1,487	$ 1,052

CF (0) $	Max Gain $	Max Gain Stock	Max Loss $	Max Loss Stock	BE
$ (17,078)	$ 1,052	$ 170.00	$ (15,948)	$ 5.65	$ 159.48

STRADDLE

A long straddle is established by BUYING A CALL and A PUT on a stock each with the same X price and same Expiration Date. The view is Volatility – If the investor is expecting that the stock will swing significantly up or significantly down based on news (FDA drug, Court Decision, etc).
The worst case scenario for straddle is no movement in the stock – max loss is the premium on both PUT and CALLS

	St <= X	**St > X**
Payoff of CALL	0	St – X
Payoff of PUT	(X – St)	+0
Total	X - St	St - X

Example 3 (Straddle)

Strategy:	Buying the Call - same exercise price as the Put				
	Buying the Put - same exercise as the Call				
Purpose:	Betting on Volatility				
	S_0 =	$ 165.13			
	X =	$ 170.00			
Buy	C =	$ 5.65	(October)	One contract = 100 shares	
Buy	P =	$ 8.75	(October)	One contract = 100 shares	
Total Premium Paid =		$ 14.40			

		OPTIONS		
Stock Price (S)	**Exercise Price (X)**	**Uncovered Options Payoff (S - X)**	**Uncovered Options Profit (π)**	**Uncovered Options Profit (π) x 100**
$ 140.00	$ 170.00	$ 30.00	$ 15.60	$ 1,560
$ 145.00	$ 170.00	$ 25.00	$ 10.60	$ 1,060
$ 150.00	$ 170.00	$ 20.00	$ 5.60	$ 560
$ 155.00	$ 170.00	$ 15.00	$ 0.60	$ 60
$ 160.00	$ 170.00	$ 10.00	$ (4.40)	$ (440)
$ 165.00	$ 170.00	$ 5.00	$ (9.40)	$ (940)
$ 170.00	$ 170.00	$ -	$ (14.40)	$ (1,440)
$ 175.00	$ 170.00	$ 5.00	$ (9.40)	$ (940)
$ 180.00	$ 170.00	$ 10.00	$ (4.40)	$ (440)
$ 185.00	$ 170.00	$ 15.00	$ 0.60	$ 60
$ 190.00	$ 170.00	$ 20.00	$ 5.60	$ 560
$ 195.00	$ 170.00	$ 25.00	$ 10.60	$ 1,060
$ 200.00	$ 170.00	$ 30.00	$ 15.60	$ 1,560

COLLARS

A collar is an option strategy that brackets the value of the portfolio between two bounds

i.e.
Suppose the investor is holding a large position of Eagle Corp. –
Current Price = $70
A lower bound of $60 can be place or the value of the portfolio by buying protection put with X = $60 – pay premium. To raise money to pay for the premium the investor rights a CALL at $80 – receives the same Premium (the same) = Net Zero premium.

Example 6 (Collars)

Strategy: Owning or Buying the stock
Buying Put Options
Selling (writing) Calls
Purpose: Protect the downside by giving up he upside to reduce premiums

	S_0 =	$	165.13		
	X =	$	170.00		
Buy	P =	$	8.75	(October)	One contract = 100 shares
Sell	C =	$	5.65	(October)	One contract = 100 shares
Preimium Paid		$	3.10		
	Purchased Shares=	100			

		PUT OPTION		
Stock Price (S)	Exercise Price (X)	Uncovered Options Payoff (X - S)	Uncovered Options Profit (π)	Uncovered Options Profit (π) x 100
$ 140.00	$ 170.00	$ 30.00	$ 21.25	$ 2,125
$ 145.00	$ 170.00	$ 25.00	$ 16.25	$ 1,625
$ 150.00	$ 170.00	$ 20.00	$ 11.25	$ 1,125
$ 155.00	$ 170.00	$ 15.00	$ 6.25	$ 625
$ 160.00	$ 170.00	$ 10.00	$ 1.25	$ 125
$ 165.00	$ 170.00	$ 5.00	$ (3.75)	$ (375)
$ 170.00	$ 170.00	$ -	$ (8.75)	$ (875)
$ 175.00	$ 170.00	$ -	$ (8.75)	$ (875)
$ 180.00	$ 170.00	$ -	$ (8.75)	$ (875)
$ 185.00	$ 170.00	$ -	$ (8.75)	$ (875)
$ 190.00	$ 170.00	$ -	$ (8.75)	$ (875)
$ 195.00	$ 170.00	$ -	$ (8.75)	$ (875)
$ 200.00	$ 170.00	$ -	$ (8.75)	$ (875)
$ 205.00	$ 170.00	$ -	$ (8.75)	$ (875)
$ 210.00	$ 170.00	$ -	$ (8.75)	$ (875)

CALL OPTION			OPTIONS COMBINED		
Uncovered Options Payoff (S - X)	Uncovered Options Profit (π)	Uncovered Options Profit (π) x 100	Uncovered Options Payoff (S - X)	Uncovered Options Profit (π)	Uncovered Options Profit (π) x 100
$ -	$ 5.65	$ 565	$ 30.00	$ 26.90	$ 2,690
$ -	$ 5.65	$ 565	$ 25.00	$ 21.90	$ 2,190
$ -	$ 5.65	$ 565	$ 20.00	$ 16.90	$ 1,690
$ -	$ 5.65	$ 565	$ 15.00	$ 11.90	$ 1,190
$ -	$ 5.65	$ 565	$ 10.00	$ 6.90	$ 690
$ -	$ 5.65	$ 565	$ 5.00	$ 1.90	$ 190
$ -	$ 5.65	$ 565	$ -	$ (3.10)	$ (310)
$ (5.00)	$ 0.65	$ 65	$ (5.00)	$ (8.10)	$ (810)
$ (10.00)	$ (4.35)	$ (435)	$ (10.00)	$ (13.10)	$ (1,310)
$ (15.00)	$ (9.35)	$ (935)	$ (15.00)	$ (18.10)	$ (1,810)
$ (20.00)	$ (14.35)	$ (1,435)	$ (20.00)	$ (23.10)	$ (2,310)
$ (25.00)	$ (19.35)	$ (1,935)	$ (25.00)	$ (28.10)	$ (2,810)
$ (30.00)	$ (24.35)	$ (2,435)	$ (30.00)	$ (33.10)	$ (3,310)
$ (35.00)	$ (29.35)	$ (2,935)	$ (35.00)	$ (38.10)	$ (3,810)
$ (40.00)	$ (34.35)	$ (3,435)	$ (40.00)	$ (43.10)	$ (4,310)

STOCK			
Proceeds from Stock	Profit from Stock		Total Profit from Covered Call
$ 14,000	$ (2,513)		$ 177
$ 14,500	$ (2,013)		$ 177
$ 15,000	$ (1,513)		$ 177
$ 15,500	$ (1,013)		$ 177
$ 16,000	$ (513)		$ 177
$ 16,500	$ (13)		$ 177
$ 17,000	$ 487		$ 177
$ 17,500	$ 987		$ 177
$ 18,000	$ 1,487		$ 177
$ 18,500	$ 1,987		$ 177
$ 19,000	$ 2,487		$ 177
$ 19,500	$ 2,987		$ 177
$ 20,000	$ 3,487		$ 177
$ 20,500	$ 3,987		$ 177
$ 21,000	$ 4,487		$ 177