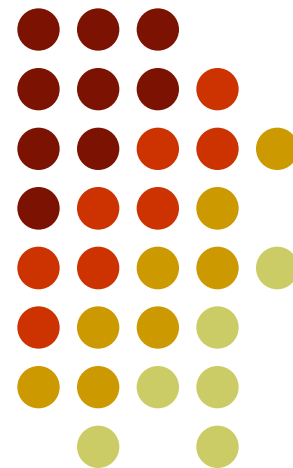


Options



Types of Options



- A call is an option to buy
- A put is an option to sell
- A European option can be exercised only at the end of its life
- An American option can be exercised at any time

Option Positions

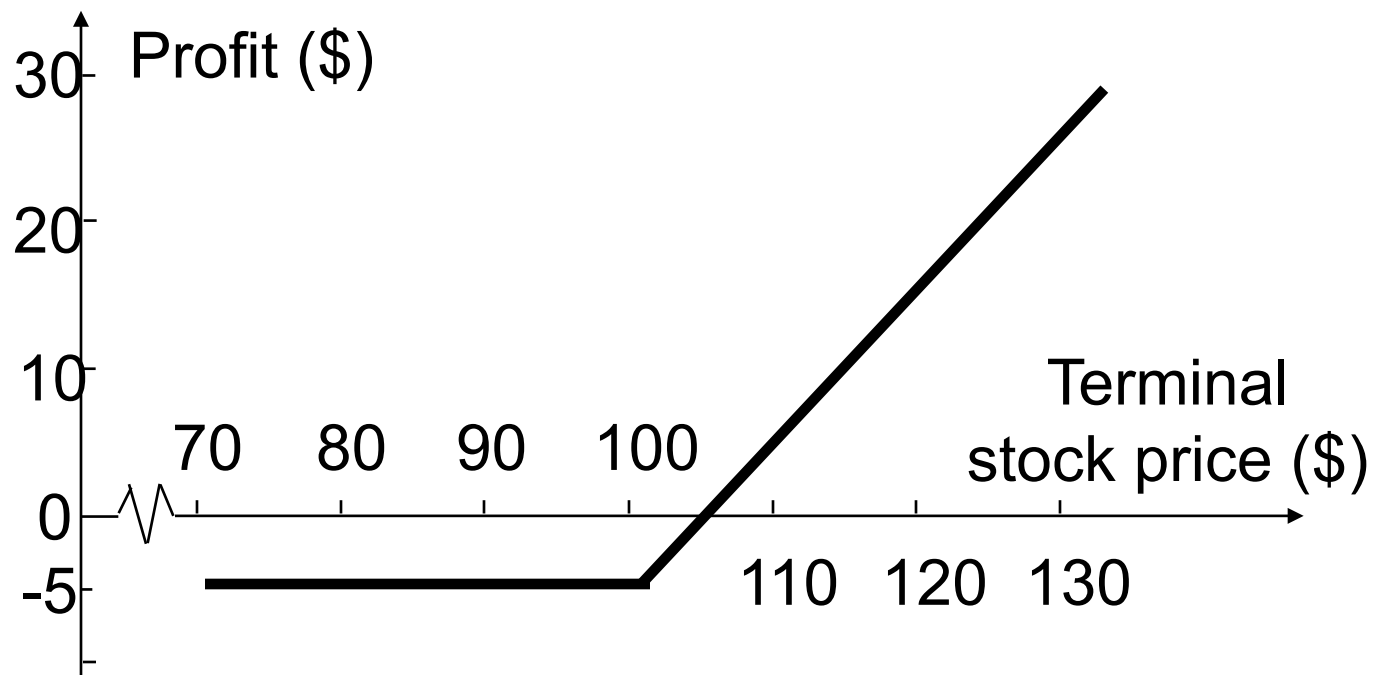


- Long call
- Long put
- Short call
- Short put

Long Call



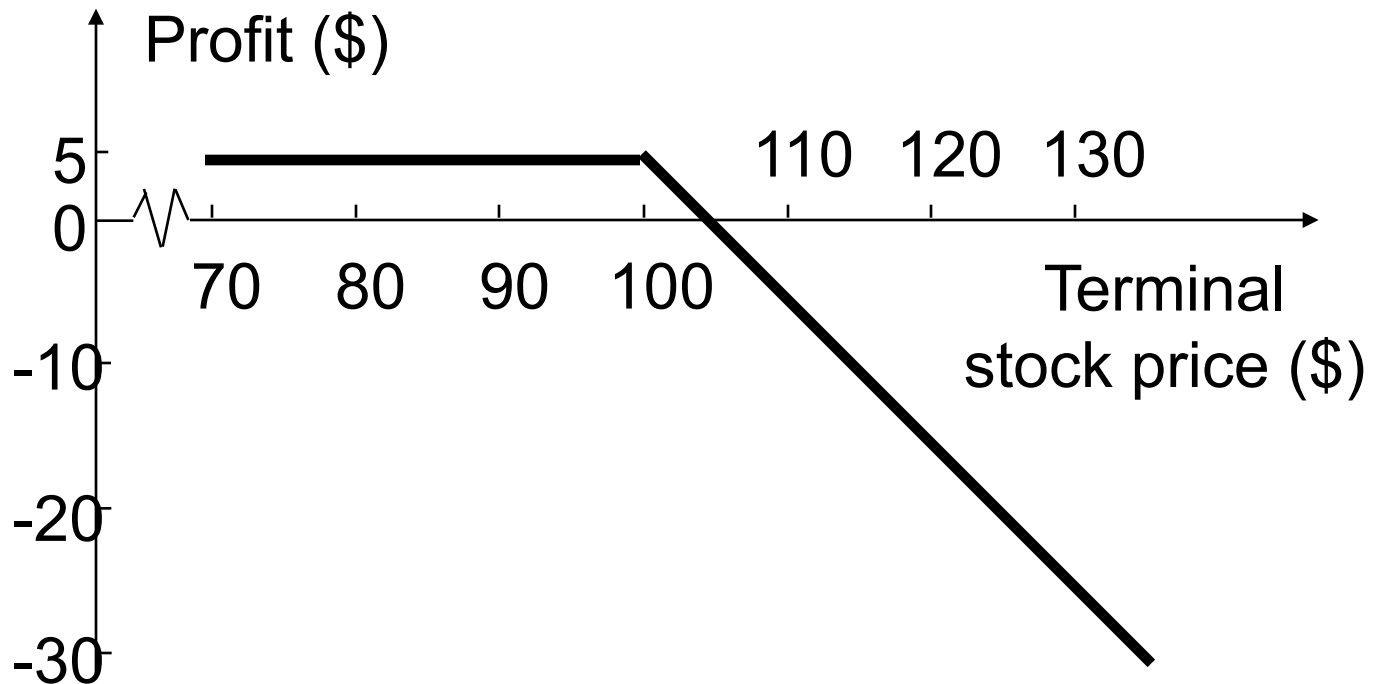
Profit from buying one European call option:
option price = \$5, strike price = \$100.



Short Call



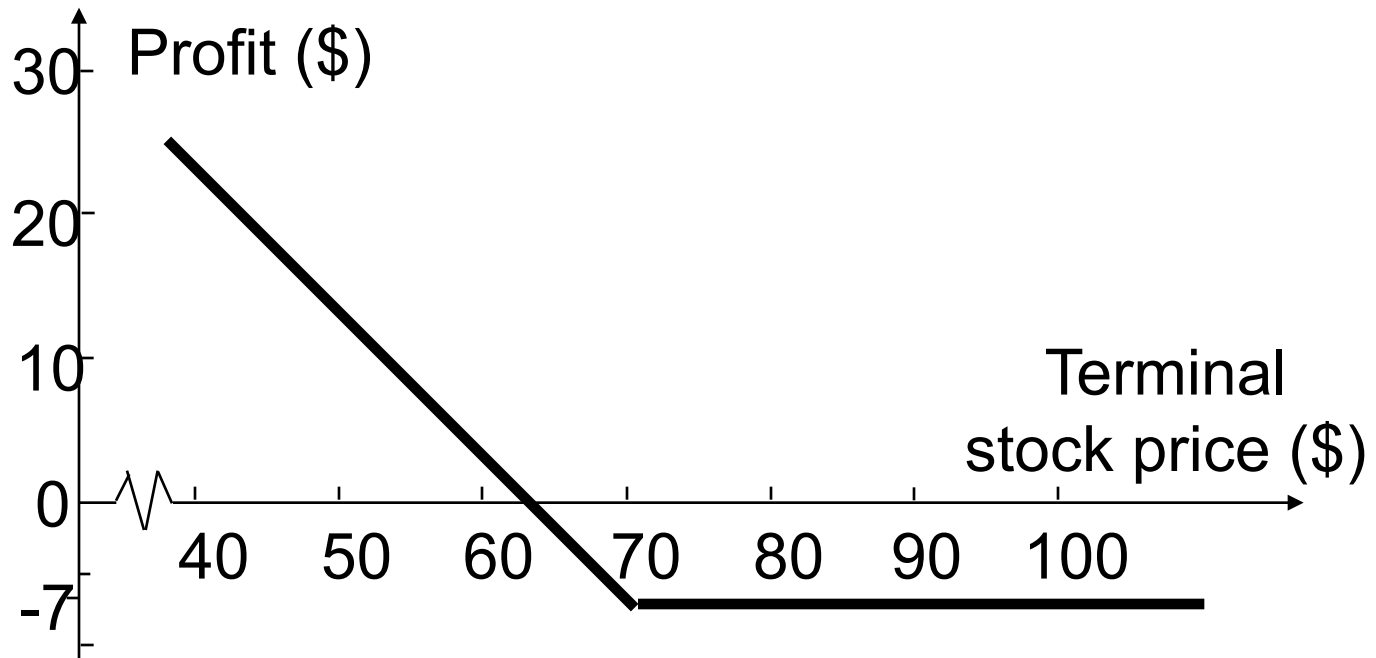
Profit from writing one European call option:
option price = \$5, strike price = \$100



Long Put



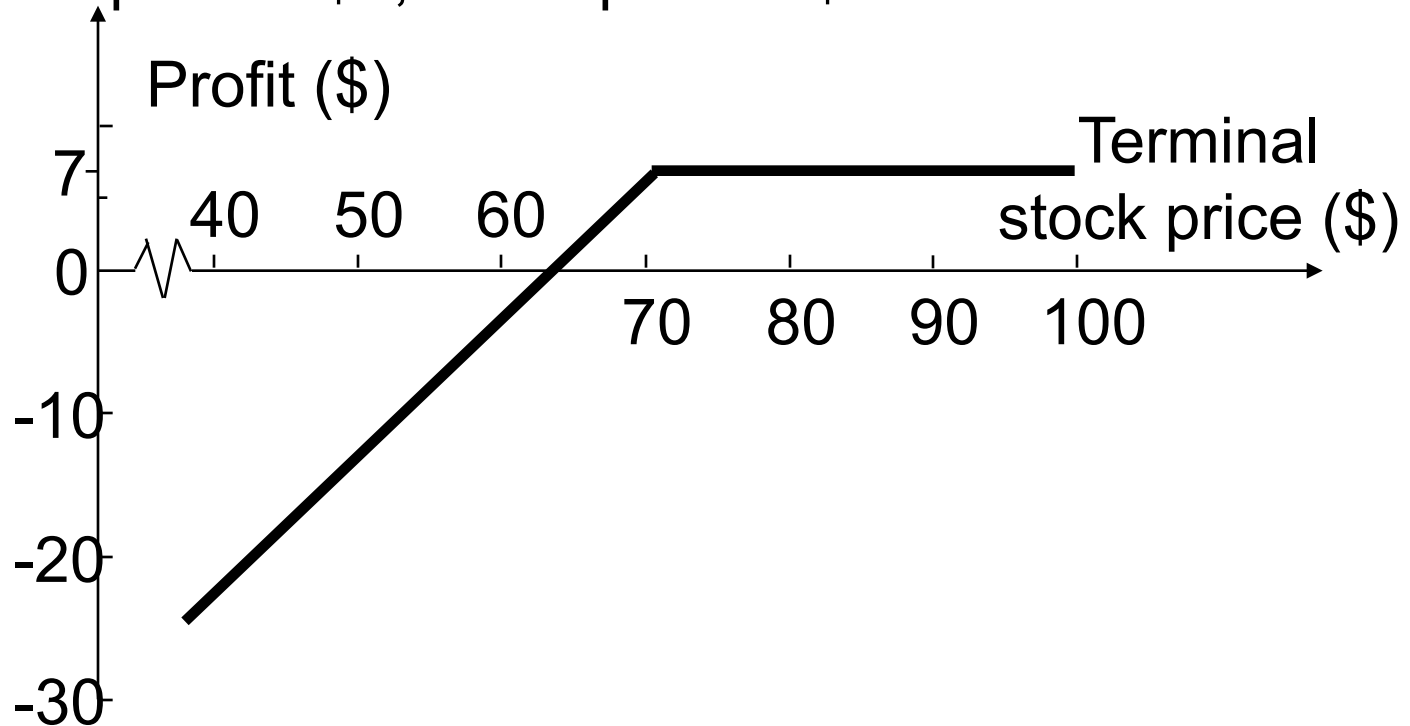
Profit from buying a European put option:
option price = \$7, strike price = \$70



Short Put



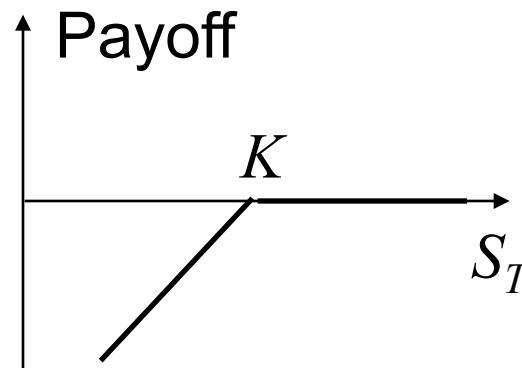
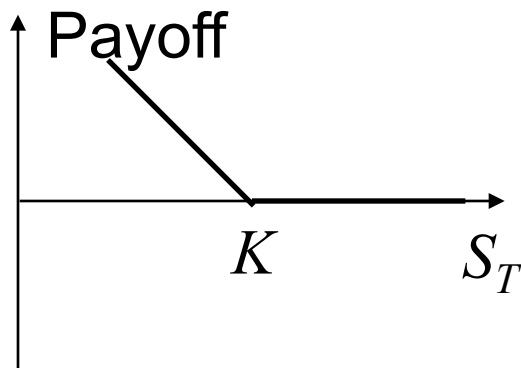
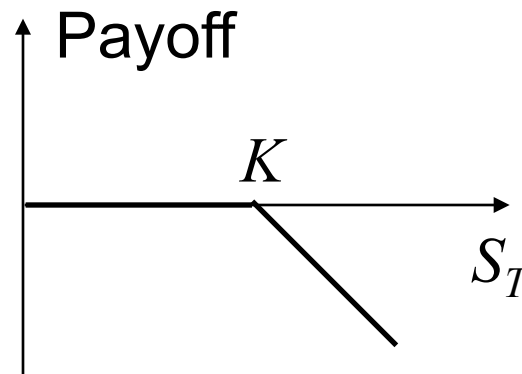
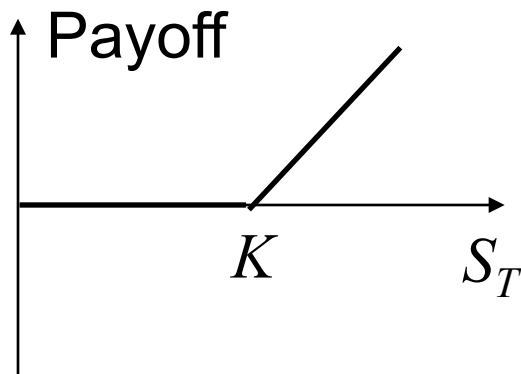
Profit from writing a European put option:
option price = \$7, strike price = \$70



Payoffs from Options

What is the Option Position in Each Case?

K = Strike price, S_T = Price of asset at maturity



Assets Underlying Exchange-Traded Options



- Stocks
- Foreign Currency
- Stock Indices
- Futures

Specification of Exchange-Traded Options



- Expiration date
- Strike price
- European or American
- Call or Put (option class)

Terminology



Moneyiness :

- At-the-money option
- In-the-money option
- Out-of-the-money option

Dividends & Stock Splits



- Suppose you own options with a strike price of K to buy (or sell) N shares:
 - No adjustments are made to the option terms for cash dividends
 - When there is an n -for- m stock split,
 - the strike price is reduced to mK/n
 - the no. of shares that can be bought (or sold) is increased to nN/m
 - Stock dividends are handled in a manner similar to stock splits



Market Makers

- Most exchanges use market makers to facilitate options trading
- A market maker quotes both bid and ask prices when requested
- The market maker does not know whether the individual requesting the quotes wants to buy or sell

Notation



- c : European call option price
- p : European put option price
- S_0 : Stock price today
- K : Strike price
- T : Life of option
- σ : Volatility of stock price
- C : American Call option price
- P : American Put option price
- S_T : Stock price at option maturity
- D : Present value of dividends during option's life
- r : Risk-free rate for maturity T with cont. comp.

American vs European Options



An American option is worth at least as much as the corresponding European option

$$C \geq c$$

$$P \geq p$$



Put-Call Parity

- Consider the following 2 portfolios:
 - Portfolio A: European call on a stock + zero-coupon bond that pays K at time T
 - Portfolio C: European put on the stock + the stock

Values of Portfolios



		$S_T > K$	$S_T < K$
Portfolio A	Call option	$S_T - K$	0
	Zero-coupon bond	K	K
	Total	S_T	K
Portfolio C	Put Option	0	$K - S_T$
	Share	S_T	S_T
	Total	S_T	K



The Put-Call Parity Result

- Both are worth $\max(S_T, K)$ at the maturity of the options
- They must therefore be worth the same today. This means that

$$c + Ke^{-rT} = p + S_0$$