COURSE CODE:(*FINC 406*)

COURSE TITLE: (*Financial Markets*)

SESSION#: (*10*) – TITLE: (DERIVATIVE MARKETS)

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Course Information

Provide the following information:	
Course Code:	*FINC 406*
Course Title:	*Financial Markets*
Course Credit	**3 Credit(s)**
Session Number & Session Title:	10 – DERIVATIVE MARKETS
Semester/Year:	2nd Semester **- 2017/18Year**
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Session Overview

- In this session, students will be introduced to strategies that are employed by most managers of financial institutions as well as non-financial institutions in managing the various risks associated with the traditional financial and commodity instruments.
- Students will be made to understand the various methods of reducing risks through the use of derivatives.
- The importance of these innovative ways of efficiently managing risks to both the local and global economies will also be discussed.

Session Learning Outcomes

At the end of the session, the student will

1. Be able to explain what derivatives are, and discuss the operations within the markets for such financial securities.
2. Be able to explain the various types of derivatives with emphasis on their primary differences among such securities.
3. Be able to discuss the importance of such securities in the financial market, as well as the various factors that impede the smooth trading of such securities in some parts of the globe.

DERIVATIVE MARKETS

Derivatives

- A derivative is a financial instrument whose value depends on – is derived from – the value of some other financial instrument, called the underlying asset.

- Contingent claims.

- Example: forwards, futures, options, and swaps

Functions of Derivatives

- Allow banks to manage the mismatch in the maturity structure of assets and liabilities.
- Hedge against risk.
- Used as a form of investment (speculators).

Forwards

- A forward contract is an agreement between a buyer and a seller to exchange a commodity or financial instrument for a specified amount of cash on a prearranged future date.
- Forward contracts are used on a variety of underlying assets such as:
  - Currencies
  - Commodities
  - Interest rates

Forwards

- In a forward:
  - Contract is negotiated directly by the seller and the buyer.
  - Terms of the contract can be “tailored”
  - Neither party can walk away unilaterally from the contract.
  - Possible default risk borne by individual parties.
  - Default controlled by collateral.

Forward : Long and Short Positions

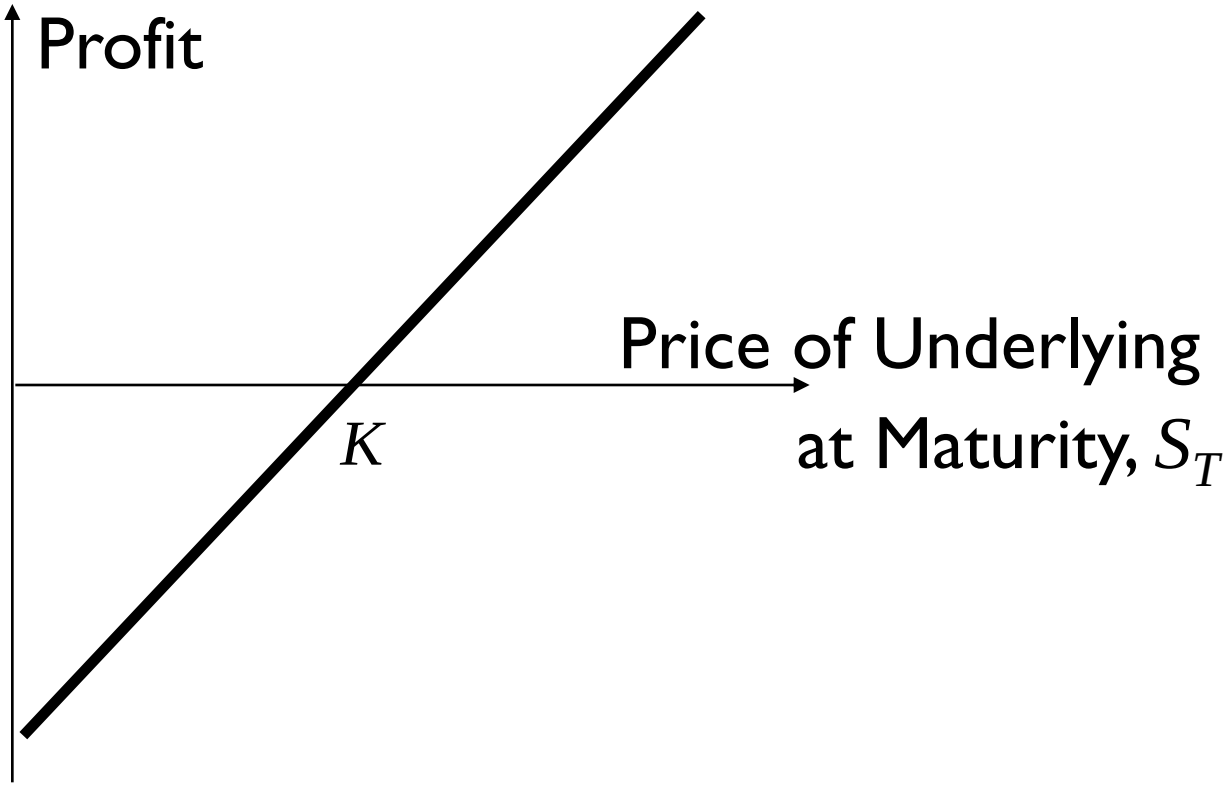
- The party that has agreed to buy has what is termed a long position

- The party that has agreed to sell has what is termed a short position

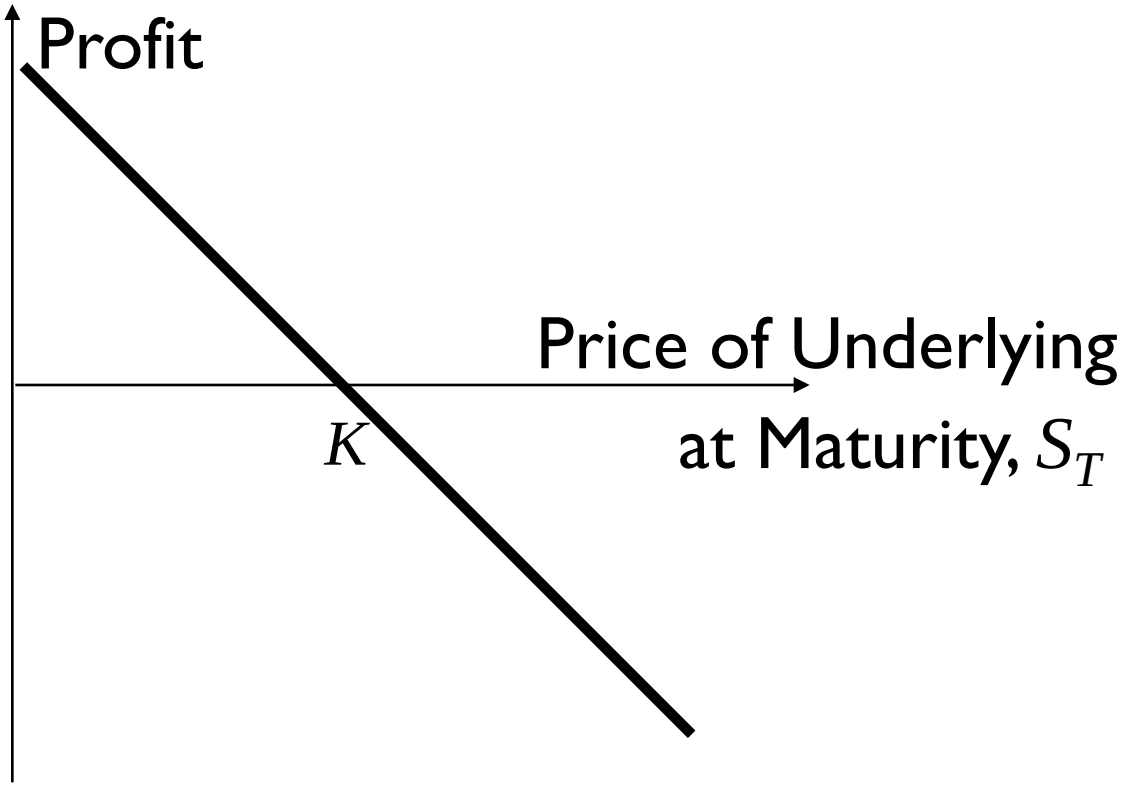
Example

- On July 20, 2007 the treasurer of a firm enters into a long forward contract to buy £1 million in six months at an exchange rate of 2.0489
- This obligates the firm to pay $2,048,900 for £1 million on January 20, 2008
- What are the possible outcomes?

Profit from a Long Forward Position



Profit from a Short Forward Position



The Forward Price of Gold

If the spot price of gold is S and the forward price for a contract deliverable in T years is F, then

$$F = S\,(1+r\,)^T$$

where r is the 1-year (domestic currency) risk-free rate of interest.

In our examples, $S = 900$, $T = 1$, and $r = 0.05$ so that

$$F = 900(1+0.05) = 945$$

Futures

- Futures contract is a forward contract that has been standardised and sold through an organised exchange
- A futures contract specifies that the seller – who has the short position – will deliver some quantity of a commodity or financial instrument to the buyer – who has the long position – on a specific date.

Futures

- In a futures contract:
  - Buyers and sellers deal through the organised exchange, not directly
  - Contract terms are standardised
  - Either party can reverse its position at anytime by closing out its contract
  - Default risk borne by exchange, not by individual parties
  - “Margin accounts” are used to reduce default risk

Margin Accounts and Marking to Market

- Margin Accounts
  - Clearing House requires both parties to futures contract to place a deposit with it.
  - Margin deposits guarantee that when the contract comes due, the parties will be able to meet their obligations.
- Marking to Market
  - Apart from the initial deposit, the Clearing House also posts daily gains and losses on the contract to the margin account of the parties involved.

Options

- An option is financial security that gives the holder the right to buy or sell specified quantity of a specified asset at a specified price on or before a specified date.
- Options are agreements between two parties
  - Seller – option writer
  - Buyer – option holder

  There are two basic options:

  Call option – right to buy – “call away”

  Put option – right to sell.

Options

- Specified price – strike or exercise price.
- Specified date – maturity date or expiration date.
- Buyer = holder = long position
- Seller = writer = short position

American and European Options

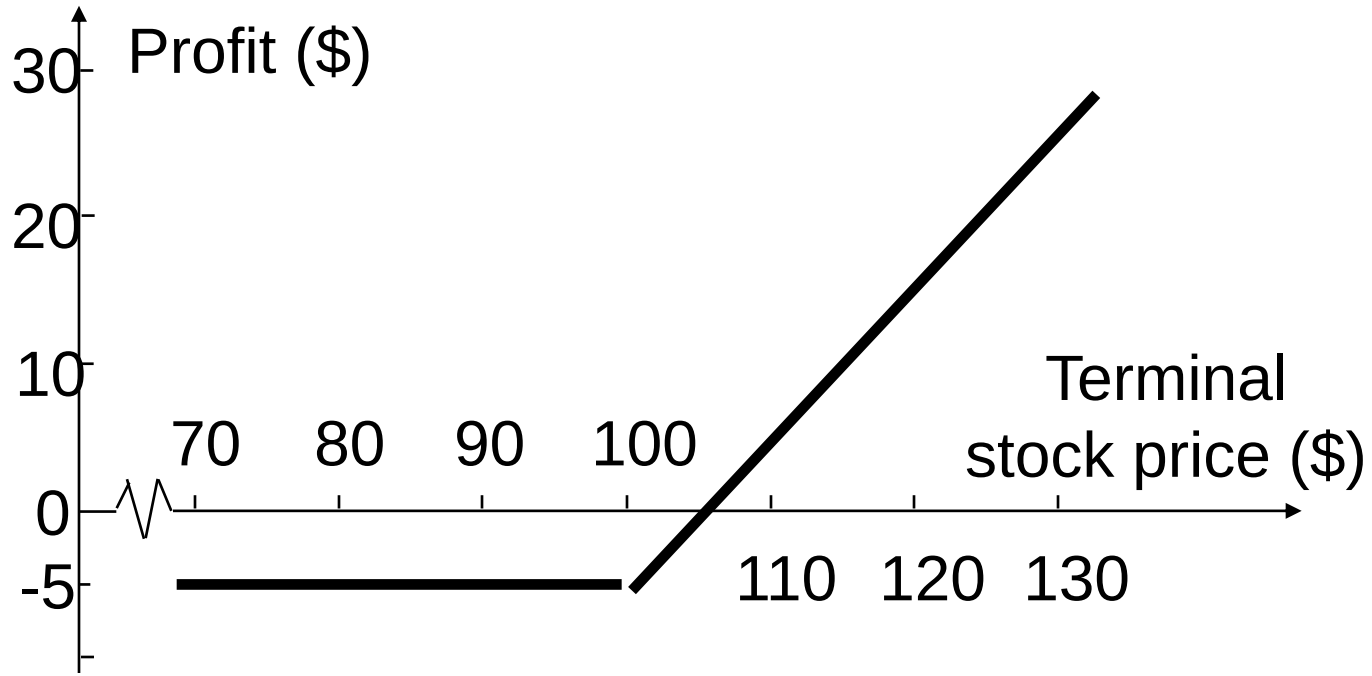
- American option
  - Can be exercised on any date from the time they are written until the day they expire
  - Holder has three choices prior to the expiration date.
    - Hold the option
    - Sell the option
    - Exercise the option
- European option
  - Can be exercised only on the day they expire
  - Holder has two choices on a date prior to expiration
    - Hold the option
    - Sell the option

Option Positions

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

Long Call

Profit from buying one European call option: option price = $5, strike price = $100, option life = 2 months



Scenarios with a Long Call – Strike Price = $100 and Premium = $5

Reducing Prices

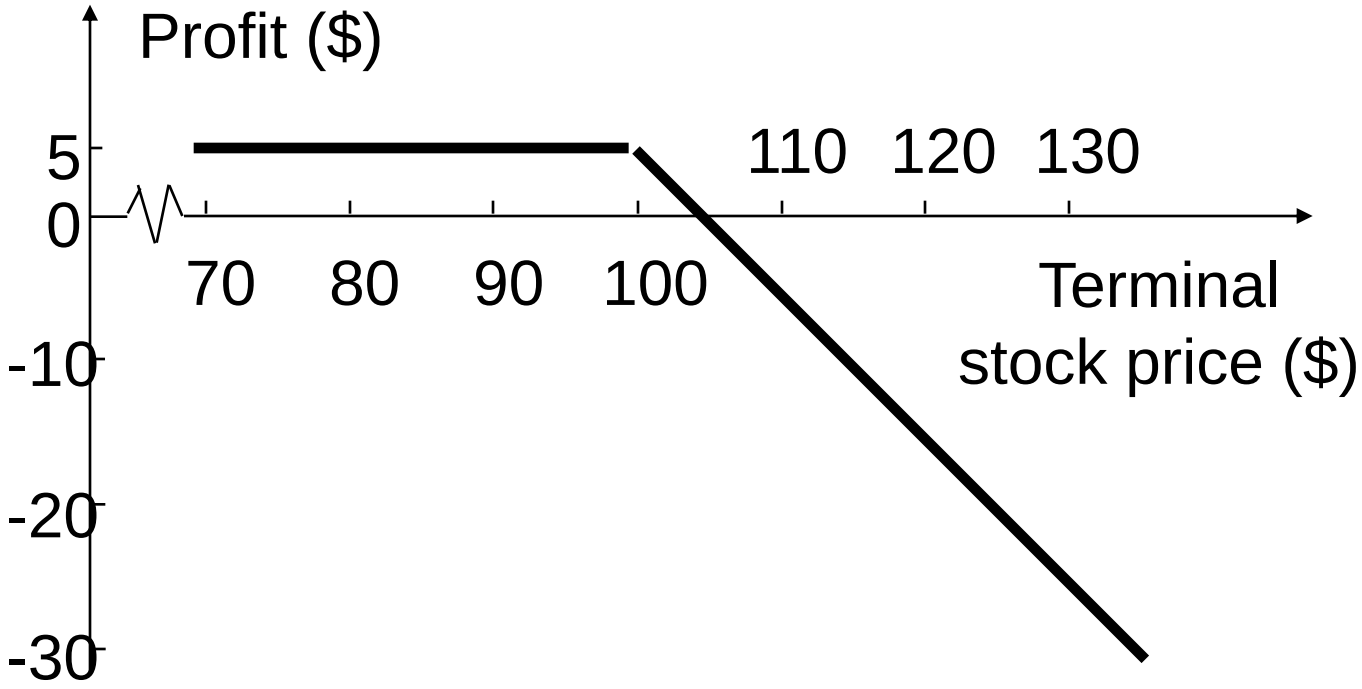
Future Spot = 70		
Buy	-100	
Sell	70	
Premium	-5	
	-35	**-5**
Future Spot = 80		
Buy	-100	
Sell	80	
Premium	-5	
	-25	**-5**
Future Spot = 90		
Buy	-100	
Sell	90	
Premium	-5	
	-15	**-5**

Increasing Prices

Future Spot = 100		
Buy	-100	
Sell	100	
Premium	-5	
	-5	
Future Spot = 105		
Buy	-100	
Sell	105	
Premium	-5	
	0	
Future Spot = 110		
Buy	-100	
Sell	110	
Premium	-5	
	5	

Short Call

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



Scenarios with a Short Call – Strike Price = $100 and Premium = $5

Reducing Prices

Future Spot = 70		
Buy	-70	
Sell	100	
Premium	5	
	35	**5**
Future Spot = 80		
Buy	-80	
Sell	100	
Premium	5	
	25	**5**
Future Spot = 90		
Buy	-90	
Sell	100	
Premium	5	
	15	**5**

Increasing Prices

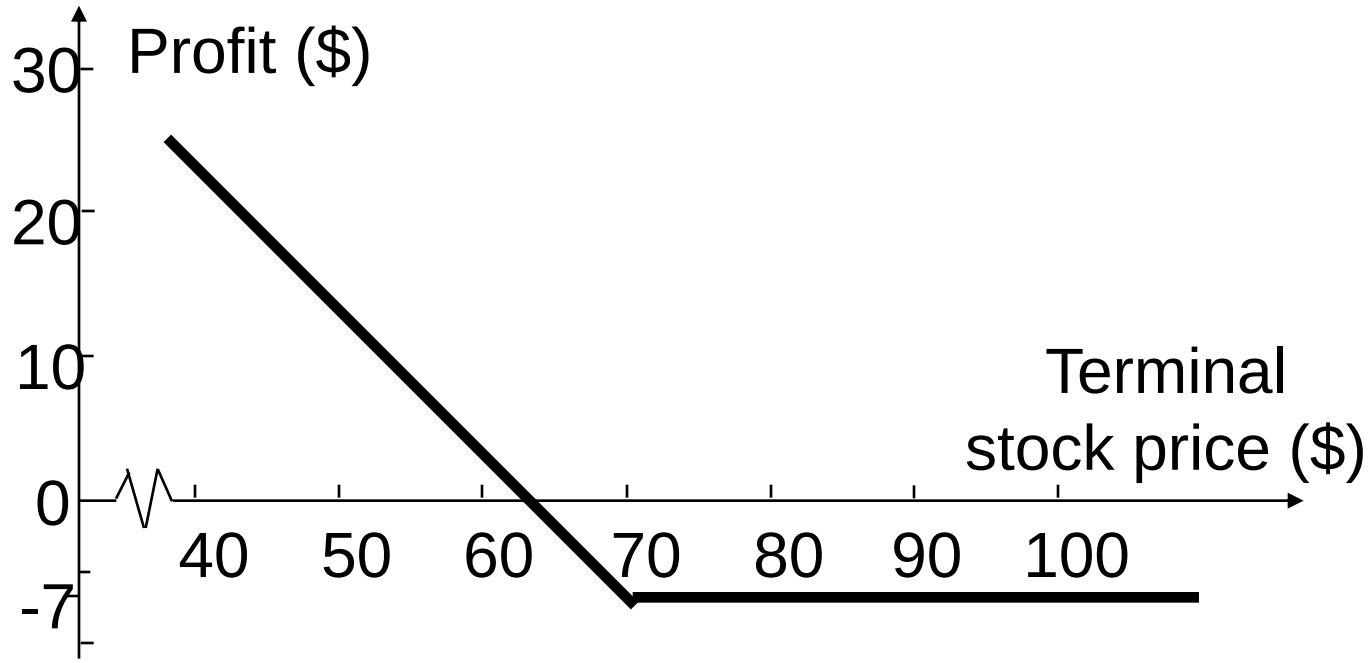
Future Spot = 100		
Buy	-100	
Sell	100	
Premium	5	
	5	
Future Spot = 105		
Buy	-105	
Sell	100	
Premium	5	
	0	
Future Spot = 110		
Buy	-110	
Sell	100	
Premium	5	
	-5	

Call Options

- In the money – when the option is profitable for the holder. Price of stock is above the strike price
- At the money – when price is equal to strike price
- Out of the money – when the option holder is incurring a loss. Price is below strike price.

Long Put

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



Scenarios with a Long Put – Strike Price = $70 and Premium = $7

Reducing Prices

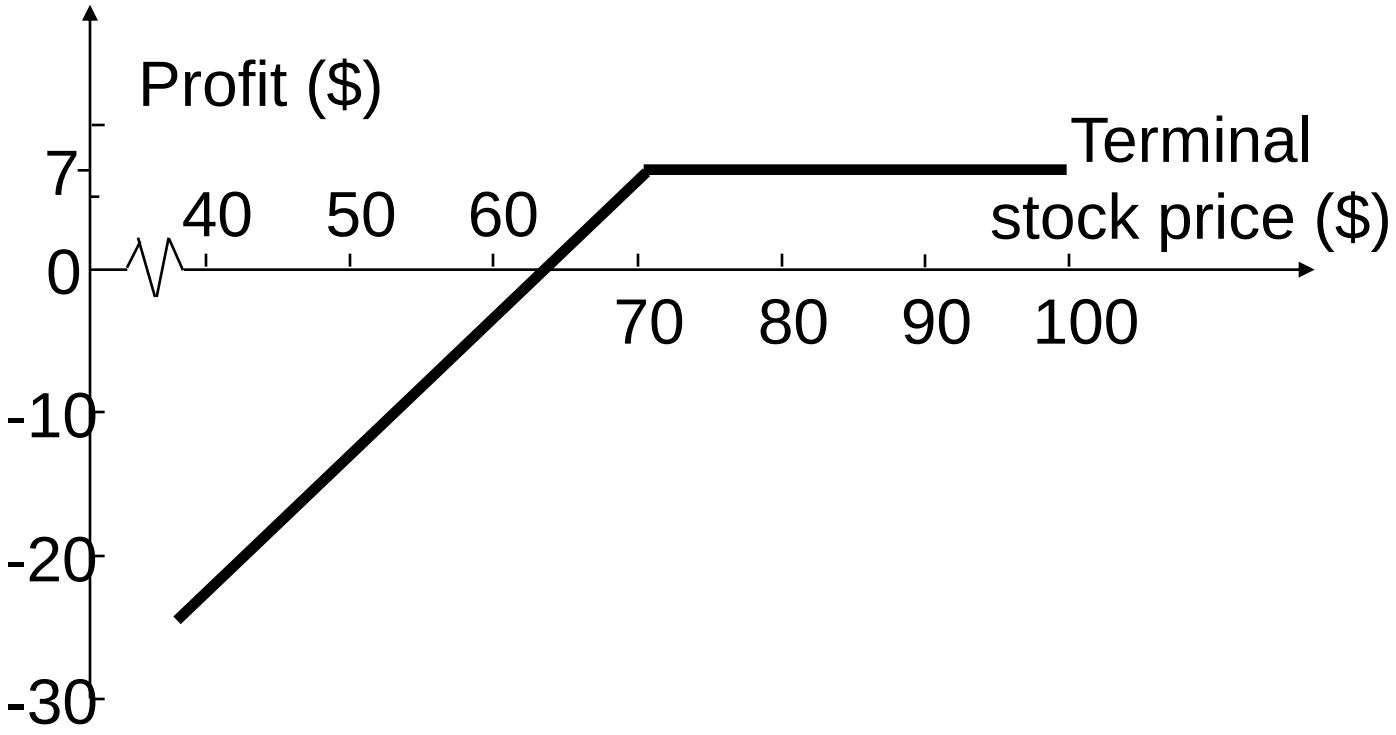
Future Spot = 40		
Buy	-40	
Sell	70	
Premium	-7	
	23	
Future Spot = 50		
Buy	-50	
Sell	70	
Premium	-7	
	13	
Future Spot = 63		
Buy	-63	
Sell	70	
Premium	-7	
	0	

Increasing Prices

Future Spot = 70		
Buy	-70	
Sell	70	
Premium	-7	
	-7	-7
Future Spot = 80		
Buy	-80	
Sell	70	
Premium	-7	
	-17	-7
Future Spot = 90		
Buy	-90	
Sell	70	
Premium	-7	
	-27	-7

Short Put

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



Scenarios with a Short Put – Strike Price = $70 and Premium = $7

Reducing Prices

Future Spot = 40		
Buy	-70	
Sell	40	
Premium	7	
	-23	
Future Spot = 50		
Buy	-70	
Sell	50	
Premium	7	
	-13	
Future Spot = 63		
Buy	-70	
Sell	63	
Premium	7	
	0	

Increasing Prices

Future Spot = 70		
Buy	-70	
Sell	70	
Premium	7	
	7	**7**
Future Spot = 80		
Buy	-70	
Sell	80	
Premium	7	
	17	**7**
Future Spot = 90		
Buy	-70	
Sell	90	
Premium	7	
	27	**7**

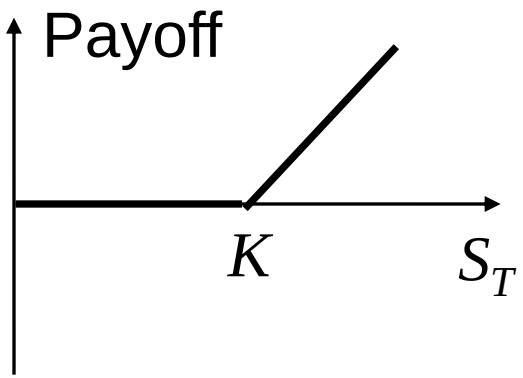
Put Options

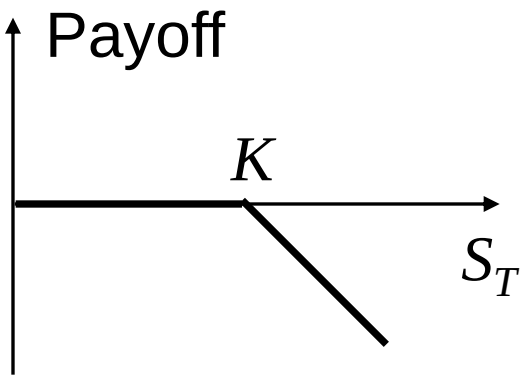
- In the money – option's strike price is above the price of stock.
- At the money – when price is equal to strike price
- Out of the money – price of stock is above strike price

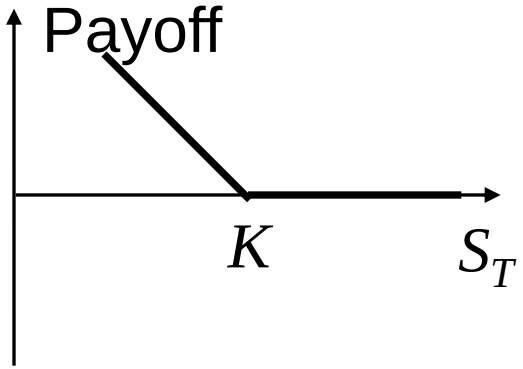
Payoffs from Options

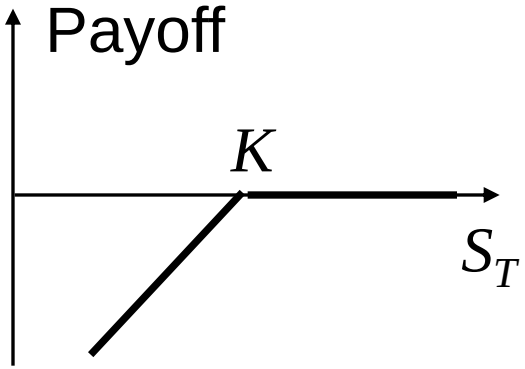
What is the Option Position in Each Case?

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









Options as Financial Insurance

- Option provides financial insurance
  - Holder has right, not obligation, to participate at specified date.
  - Right will be exercised only if it is in the holder's interest to do so.
  - Holder can profit, but lose from exercise decision.
- The writer of the position provides this insurance to the holder
  - The writer is obligated to take part in the trade if the holder should so decide.
- In exchange, writer receives a fee called the option price or the option premium.

Pricing Options

- An option has two parts:
  - The value of the option if it is exercised immediately (intrinsic value).
  - The fee paid for the option's potential benefits (option premium).

- Option Price = intrinsic value + option premium

The Option Valuation Approach

Variable	*Financial Option*	*Firm Option*
X/P_e	*Exercise Price*	*PV of expenditures required to undertake project*
S/P_a	*Stock Price*	*Present value of expected cash flows from the project*
t	*Time to expiration*	*The length of time that the investment decision can be deferred*
SD	*Standard deviation of return on the stock*	*Riskiness of the underlying cash flows*
RF	*Time value of money*	*Risk-free rate*

The Option Valuation Approach

- Sharon Rock, a famous Venture Capitalist was considering whether to invest in ThinkTank Inc. a company owned and managed by Mr. Brain. ThinkTank's new product was ready to be manufactured and marketed. An expenditure of $120 million was required to construct research and manufacture facilities. Rock was of the opinion that the projections drawn by Mr. Brain and his associates were justifiable. Rock performed an NPV analysis using a WACC of 25% and a terminal growth rate of 3%.

- She was unimpressed with the resulting valuation of -$11.55 million.

- After thinking more carefully, rock realized that the investment could be broken down into two stages. The initial investment, which would need to be made immediately, would be $20 million for R&D and personnel. The $100 million on plant could be undertaken any time in the first two years. Whenever the project would be undertaken, the present value of the plant construction cost would total $100 million in today's dollars.

The Option Valuation Approach

- Rock decided that the option to expand should not be valued using DCF techniques since she would pursue the opportunity only if the first stage of the project were successful. The expansion opportunity could more validly be considered as an initial $20 million investment bundled with a two-year European call option which can be priced using the Black-Scholes option pricing model.

- Assume that t =2 and RF = 0.07. X = $100 and S = 108.45. If SD is 50%, should rock proceed with the investment?

Applying the Black-Scholes Module

- $Value\ of\ Option = [P_a\ .N(d_1)] - [P_e.e^{-rt}.N(d_2)]$
- $d_1 = \frac{Ln\left(\frac{Pa}{P_e}\right) + (r + 0.5s^2)t}{s\sqrt{t}}$
- $d_1 = \frac{Ln\left(\frac{108.45}{100}\right) + (0.07 + 0.5.0.5^2)2}{0.5\sqrt{2}}$
- $d_1 = \frac{0.0811 + 0.39}{0.7071} = 0.6662$
- $N(d_1) = 0.5 + 0.2454 = 0.7454$

Applying the Black-Scholes Module

- $Value\ of\ Option = [P_a\ .N(d_1)] - [P_e.e^{-rt}.N(d_2)]$
- $d_2 = d_1 - s\sqrt{t}$
- $d_2 = 0.6662 - 0.7071 = -0.0409$
- $N(d_2) = 0.5 - 0.0159 = 0.4841$

Applying the Black-Scholes Module

- $Value\ of\ Option = [P_a\ .N(d_1)] - [P_e.e^{-rt}.N(d_2)]$

- $Value\ of\ Option = [108.45\ .0.7454] - [100.2.718^{-0.07.2}.0.4841]$

- $Value\ of\ Option = [80.81] - [42.09\ ] = 38.72$

- $NPV\ of\ Investment = -Initial\ Investment + Value\ of\ Option$

- $NPV\ of\ Investment = -20 + 38.72 = \$18.72\ million$

Swaps

- A swap, in general, is an agreement to exchange cash flows at specified future time according to specified rules.
- The most common kind of swap is the plain vanilla, fixed-for-floating interest rate swap:
  - One counterparty pays the fixed payments in exchange for receiving floating payments according to some pre-specified index (LIBOR)
  - Principals not exchanged.
- Other kinds of swaps also exist

Swaps

- A swap is based on an exchange by one party of a particular benefit, which it enjoys in one market for a corresponding benefit available to another party in a different market.
- Originally, swaps were agreements between companies that had equal but opposite requirements.
- In principle, a swap is the simultaneous buying or selling of a similar underlying assets that give both parties a benefit they wouldn't have had without the transaction.

Objectives of Swaps

- Hedging of interest rate risk, foreign exchange risk, commodity price risk, equity investment risk etc.
- Speculation (assumption of risk in expectation of profit).
- Lowering funding costs (overcoming market imperfection or regulation), flexibility etc.

Standard (Plain Vanilla) Type of Swaps

- Interest rate swaps (eg fixed rate for floating rate)
- Commodity swaps
- Equity swaps
- Currency swaps
- Credit risk swaps

SWAPS

Example (vanilla/annually settled)

	XYZ	ABC
fixed rate	10%	11.5%
floating rate	libor + .25	libor + .50

Q: if libor = 7%, what swap can be made and what is the profit (assume $1mil face value loans)

A:

XYZ borrows $1mil @ 10% fixed

ABC borrows $1mil @ 7.5% floating

XYZ pays floating @ 7.25% to ABC

ABC pays fixed @ 10.50% to XYZ

SWAPS

Example - cont

Benefit to XYZ	Net position
floating +7.25 -7.25	0
fixed +10.50 -10.00	+.50
Net gain	+.50%

Benefit ABC	Net Position
floating +7.25 - 7.50	-.25
fixed -10.50 + 11.50	+1.00
net gain	+.75%

SWAPS

Example - cont

Settlement date

ABC pmt 10.50 x 1mil = 105,000

XYZ pmt 7.25 x 1mil = 72,500

net cash pmt by ABC = 32,500

if libor rises to 9%

settlement date

ABC pmt 10.50 x 1mil = 105,000

XYZ pmt 9.25 x 1mil = 92,500

net cash pmt by ABC = 12,500

Interest rate swap example

- Company A can access financial market:
  - LIBOR + 3/8%
  - Fixed Eurobond 11 ½%
- Company B can access financial market:
  - LIBOR + 1 1/8%
  - Fixed Eurobond (if at all) 13%
- How can a swap reduce financing cost and possible risk?
- Assume A and B on a fixed rate of 12 5/8%

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