M339D : March 22nd, 2021.

European put Options.

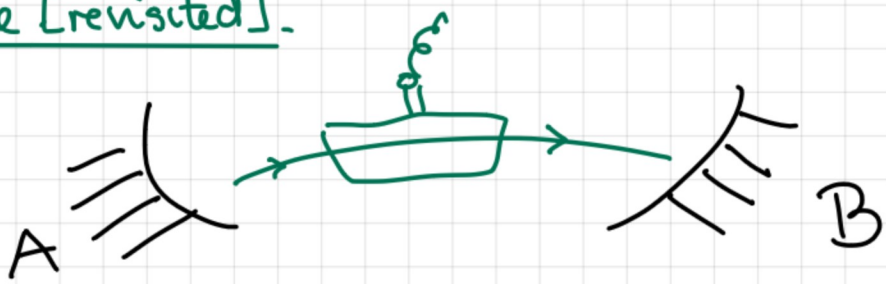
put written

Premium paid by the buyer to the writer of put.

Put owner has the right, but not an obligation to sell the underlying asset @ the strike price.

The writer must do what the owner decides.

Example [revisited].



Inherently : must buy oil @ A

Long Forward

Long Call

sell

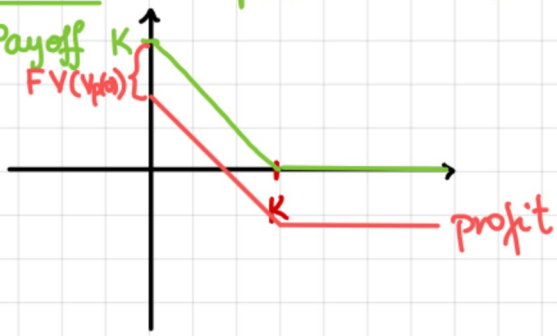
Inherently : must deliver the oil @ B

Short Forward

Long Put

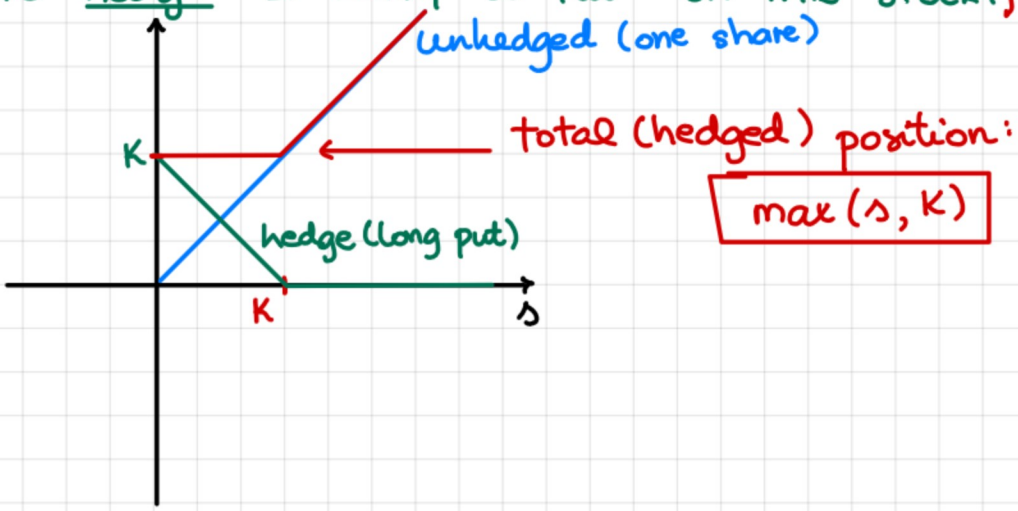
Payoff : $V_P(T) = (K - S(T))_+$

Payoff function: $v_P(s) = (K-s)_+$



Example. Start w/ an outright purchase of a non-dividend-paying stock.

To hedge I LONG a Put on this stock. } FLOOR.



Covered Put.

Start w/ a written European put w/ strike K and exercise date T.
You add a short sale of the underlying stock (say, no dividends!) to be closed @ time T.

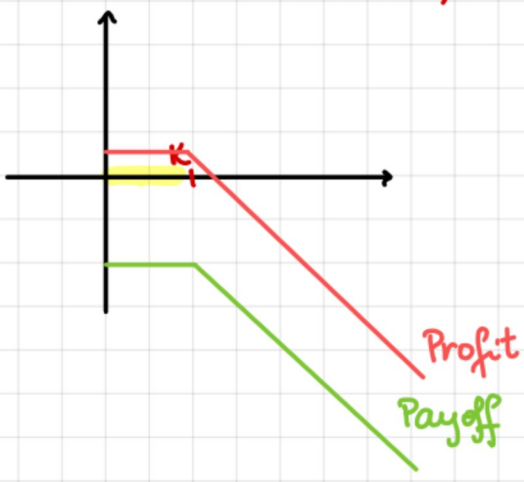
The Payoff:

$$\underbrace{-V_p(T)}_{\text{written put}} \underbrace{-S(T)}_{\text{short stock}} =$$

$$= -(K-S(T))_+ - S(T)$$

$$= \begin{cases} -K + \cancel{S(T)} - \cancel{S(T)} & \text{if } K > S(T) \\ -S(T) & \text{if } K \le S(T) \end{cases}$$

$$= -\max(K, S(T))$$



∴ Unlimited loss potential

Moneyness.

Consider an option written @ time-0 w/ an exercise/expiration date T.

Imagine the cashflow for the option's owner if they were to exercise it @ time-t.

If cashflow is
- >0 then the option is in-the-money
- $=0$ then the option is at-the-money
- <0 then the option is out-of-the-money

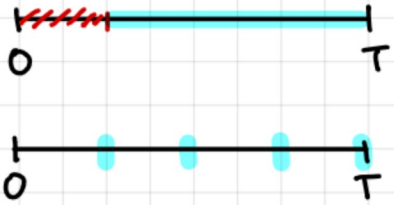
The usual uses:

- The establishing of the strike for a call or put. At time-0, if at-the-money, then $K = S(0)$.
- To be taken into consideration @ admissible exercise dates.

For European options: exercise if and only if the option is in-the-money on the exercise date.

For American options:

For Bermudan options:



For a rational owner of the option, it only makes sense to exercise an option early if it's in-the-money. So, this is a necessary condition, but it's (not) sufficient.