European PUT Options

D: Feb 20TH, 2019.

Usually, a RIGHT to SELL the underlying.

At time 0:

The put is written, i.e.,
the buyer and the writer of the put agree on:

- the underlying asset : $S(t)$, $t \geq 0$
- the exercise date : T
- the strike/exercise price : K

The put premium $V_p(0)$ is paid by the buyer of the put & received by the writer of the put.

At time T:

The put's owner has the right, but NOT an obligation to
SELL 1 unit of the underlying
for the strike price K.

The writer of the put is obligated to do what the owner opts for.

Q: What is the put owner's optimal behavior?
What is the condition for exercise?

$K > S(T)$ => long put

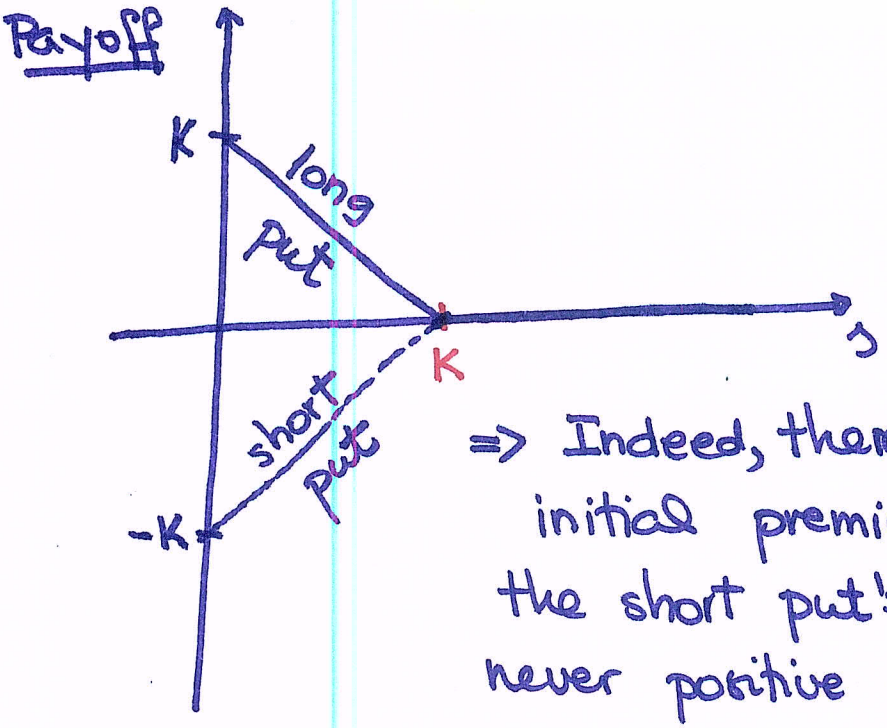
1 unit of asset $S(T)$ ↓ written put

↑ strike price K

$\Rightarrow$ **Payoff**: $V_p(T) = \begin{cases} K - S(T) & \text{if } K > S(T) \\ 0 & \text{if } K \leq S(T) \end{cases}$

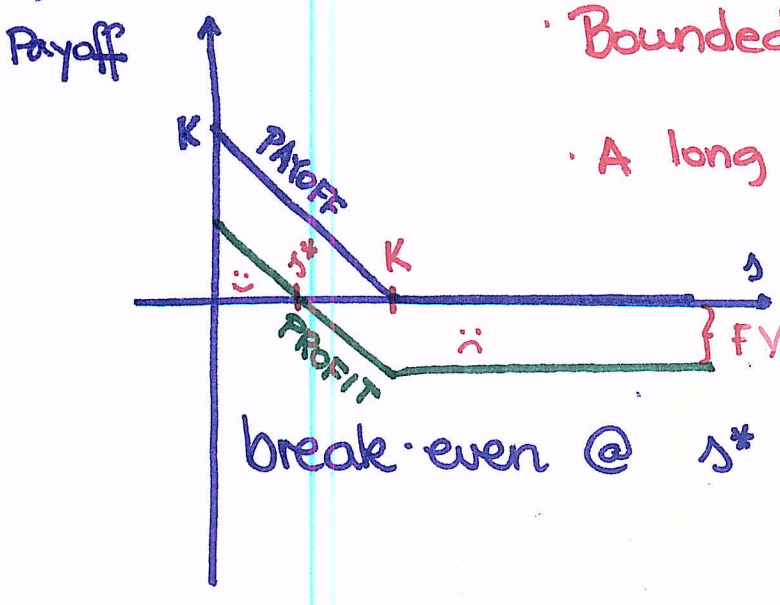
$\Rightarrow$ $V_p(T) = MAX[K - S(T), 0] = (K - S(T))_+$

$\Rightarrow$ **Payoff f'tion**: $v_p(s) = (K - s)_+$



$\Rightarrow$ Indeed, there must be an initial premium $V_p(0)$ since the short put's payoff is never positive and sometimes negative.

$\Rightarrow$ **Profit curve**:



- Bounded both from below & from above.
- A long put is short w/ respect to the underlying.

break-even @ $s^* = K - FV_{0,T}(V_p(0))$

75.

Determine which of the following risk management techniques can hedge the financial risk of an oil producer arising from the price of the oil that it sells.

↳ an inherent long position

✓ I. Short forward position on the price of oil
✓ II. Long put option on the price of oil
✗ III. Long call option on the price of oil

(A) I only
(B) II only
(C) III only
(D) I, II, and III
(E) The correct answer is not given by (A), (B), (C), or (D)

Only: I & II ∴

∴

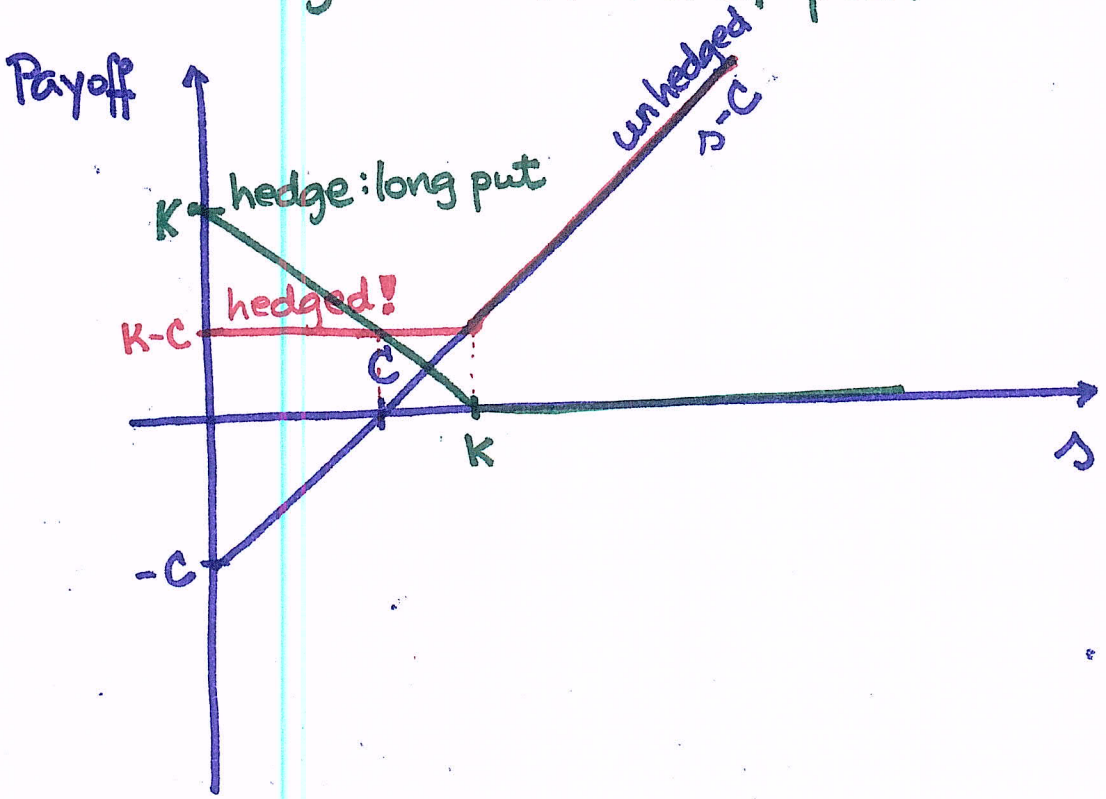
Q: Tanker transporting crude oil from Port A to Port B. You can trade in options @ both ports. What do you do?

→: Long call @ Port A (forward) & long put @ B. (short forward)

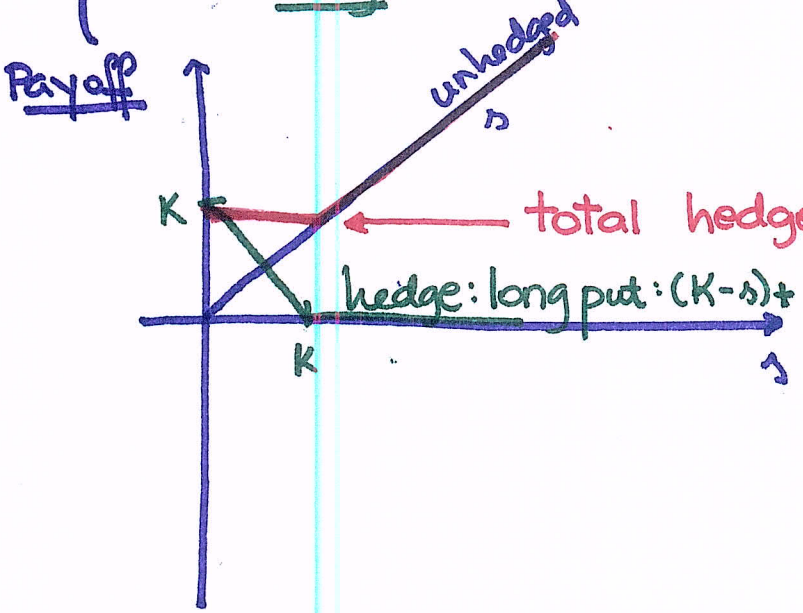
3.

Hedging a long position w/ a long put

Example.
- Unhedged: Producer of a good.
- Hedge: A LONG put.



Example Start with:
- Outright purchase of a non-dividend paying stock
- The hedge
  - a long PUT on the above stock



Note: The shape looks like the call payoff.

48.

For a certain stock, Investor A purchases a 45-strike call option while Investor B purchases a 135-strike put option. Both options are European with the same expiration date. Assume that there are no transaction costs.

If the final stock price at expiration is S, Investor A's payoff will be 12.

Calculate Investor B's payoff at expiration, if the final stock price is S.

(A) 0
(B) 12
(C) 36
(D) 57
(E) 78

Investor A: Payoff f'tion:

$v_c(s) = (s-K)_+$

=> At the stock price s which was realized:

$(s-K)_+ = 12 \Rightarrow s = 45+12 = 57$

=> Investor B: $v_p(s) = (135-s)_+ = (135-57)_+ = 78 \Rightarrow$ (E) ■

22.

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23.

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24.

Determine which of the following statements is NOT a typical reason for why derivative securities are used to manage financial risk.

(A) Derivatives are used as a means of hedging.

(B) Derivatives are used to reduce the likelihood of bankruptcy.

(C) Derivatives are used to reduce transaction costs.

(D) Derivatives are used to satisfy regulatory, tax, and accounting constraints.

(E) Derivatives are used as a form of insurance.

25.

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26.

Determine which, if any, of the following positions has or have an unlimited loss potential from adverse price movement in the underlying asset, regardless of the initial premium received.

✓ I. Short 1 forward contract

✓ II. Short 1 call option

✗ III. Short 1 put option ← Bounded BOTH from below & above!

(A) None

(B) I and II only

(C) I and III only

(D) II and III only

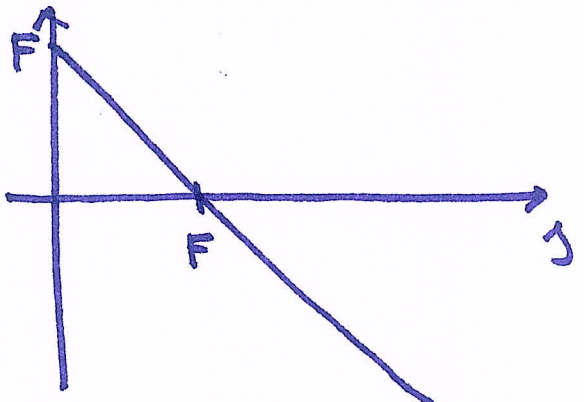
(E) The correct answer is not given by (A), (B), (C), or (D)

Short forward payoff funtion:

⇓

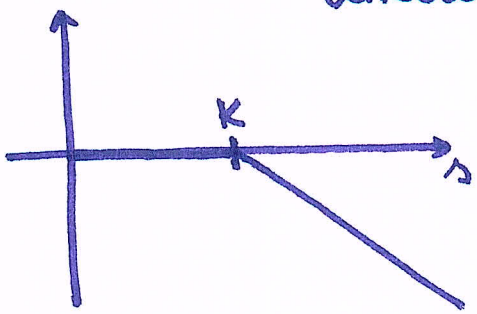
Selling forward @ the forward price F

payoff f'tion = F − s



unbounded from below!

Short call:



unbounded from below!

- written put
- short sale of the underlying stock

} Covered Put

The Payoff: $-V_P(T) - S(T) =$

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

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

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

$\therefore$