D: Feb 22nd, 2019.

13.

SHORT SALE

LONG CALL

A trader shorts one share of a stock index for 50 and buys a 60-strike European call option on that stock that expires in 2 years for 10. Assume the annual effective risk-free interest rate is 3%.

$V_c(0)$ $\quad i = 0.03$

The stock index increases to 75 after 2 years.

$S(T)$ is realized to be!

Calculate the profit on your combined position, and determine an alternative name for this combined position.

		Profit	Name	
✗	(A)	–22.64	Floor	Long Stock + Long Put
✗	(B)	–17.56	Floor	
?	(C)	–22.64	Cap	Short Stock + Long Call
?	(D)	–17.56	Cap	
✗	(E)	–22.64	"Written" Covered Call	written call + long stock

14.

The current price of a non-dividend paying stock is 40 and the continuously compounded risk-free interest rate is 8%. You are given that the price of a 35-strike call option is 3.35 higher than the price of a 40-strike call option, where both options expire in 3 months.

Calculate the amount by which the price of an otherwise equivalent 40-strike put option exceeds the price of an otherwise equivalent 35-strike put option.

(A) 1.55

(B) 1.65

(C) 1.75

(D) 3.25

(E) 3.35

1.

Cap : **Payoff** = $\underbrace{(S(T)-K)_+}_{\text{Long Call}} + \underbrace{(-S(T))}_{\text{Short Stock}}$

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

Payoff (in this problem) is @ $S(T) = 75$:

$\Rightarrow$ $\boxed{\text{Payoff} = -60}$

Initial Cost : $-50 + 10 = -40$

$$\text{Profit}\,(S(T)=75) = -60 - FV_{0,2}(-40)$$
$$= -60 + 40\,(1.03)^2 = -17.56$$

62.

The price of an asset will either rise by 25% or fall by 40% in 1 year, with equal probability. A European put option on this asset matures after 1 year.

Assume the following:

- Price of the asset today: $\boxed{100 = S(0)}$
- Strike price of the put option: 130 $= \boxed{K=130}$
- Put option premium: 7 $\boxed{V_P(0)=7}$
- Annual effective risk free rate: 3%

$i = 0.03$

$$S(1) \sim \begin{cases} 125, & \text{w/ probab. } 1/2 \\ 60, & \text{w/ probab. } 1/2 \end{cases}$$

Calculate the expected profit of the put option.

(A) 12.79

(B) 15.89

(C) 22.69

(D) 27.79

(E) 30.29

In general:

$$\mathbb{E}[\text{Profit}] = \mathbb{E}[\text{Payoff} - FV_{0,T}(\text{Init. cost})]$$

$$= \mathbb{E}[\text{Payoff}] - FV_{0,T}(\text{Init. Cost})$$

In this problem: the payoff function of the put:

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

$$V_P(1) = v_P(S(1)) \sim \begin{cases} 5 & \text{w/ probab. } 1/2 \\ 70 & \text{w/ probab. } 1/2 \end{cases}$$

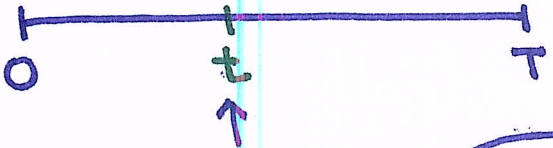
$$\Rightarrow \mathbb{E}[V_P(1)] = 5 \cdot \tfrac{1}{2} + 70 \cdot \tfrac{1}{2} = 37.5$$

$$\Rightarrow \mathbb{E}[\text{Profit}] = 37.5 - 7(1.03) =$$

$$= 30.29 \Rightarrow \text{(E)}$$

Moneyness.

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

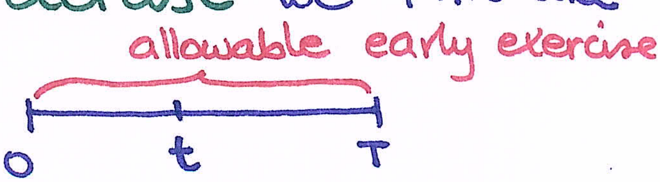


Imagine the cashflow for the option's owner if (s)he were to exercise it @ time·t.

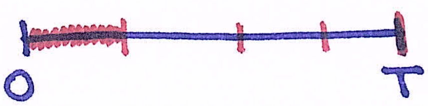
If cashflow $\begin{cases} >0 & \text{we say the option is in·the·money} \\ =0 & \text{— '' ——— at·the·money} \\ <0 & \text{— '' ——— out·of·the·money} \end{cases}$

Usually:

- Used to stipulate the strike price of a call / put. At time·0, if at·the·money then $K = S(0)$.
- To take into consideration for the following types of options: allowing for early exercise we introduce
  - American options



  - Bermudan options



61.

An investor purchased Option A and Option B for a certain stock today, with strike prices 70 and 80, respectively. Both options are European one-year put options.

$K_A < K_B$

Determine which statement is true about the moneyness of these options, based on a particular stock price.

At time t: $K_A > S(t) \Rightarrow K_B > S(t)$

T (A) If Option A is in-the-money, then Option B is in-the-money.

(B) If Option A is at-the-money, then Option B is ~~out-of-the-money~~. IN-THE-MONEY

(C) If Option A is in-the-money, then Option B is out-of-the-money. (opposite of (A))

(D) If Option A is out-of-the-money, then Option B is in-the-money.

Counterexample: $S(t)=81$

(E) If Option A is out-of-the-money, then Option B is out-of-the-money.

Counterexample: $S(t)=75$

66.

$S(0)=80$

The current price of a stock is 80. Both call and put options on this stock are available for purchase at a strike price of 65.

$K=65$

Determine which of the following statements about these options is true.

X (A) Both the call and put options are at-the-money. $S(0) \neq K$

X (B) Both the call and put options are in-the-money. NEVER!

X (C) Both the call and put options are out-of-the-money. NEVER!

T (D) The call option is in-the-money, but the put option is out-of-the-money.

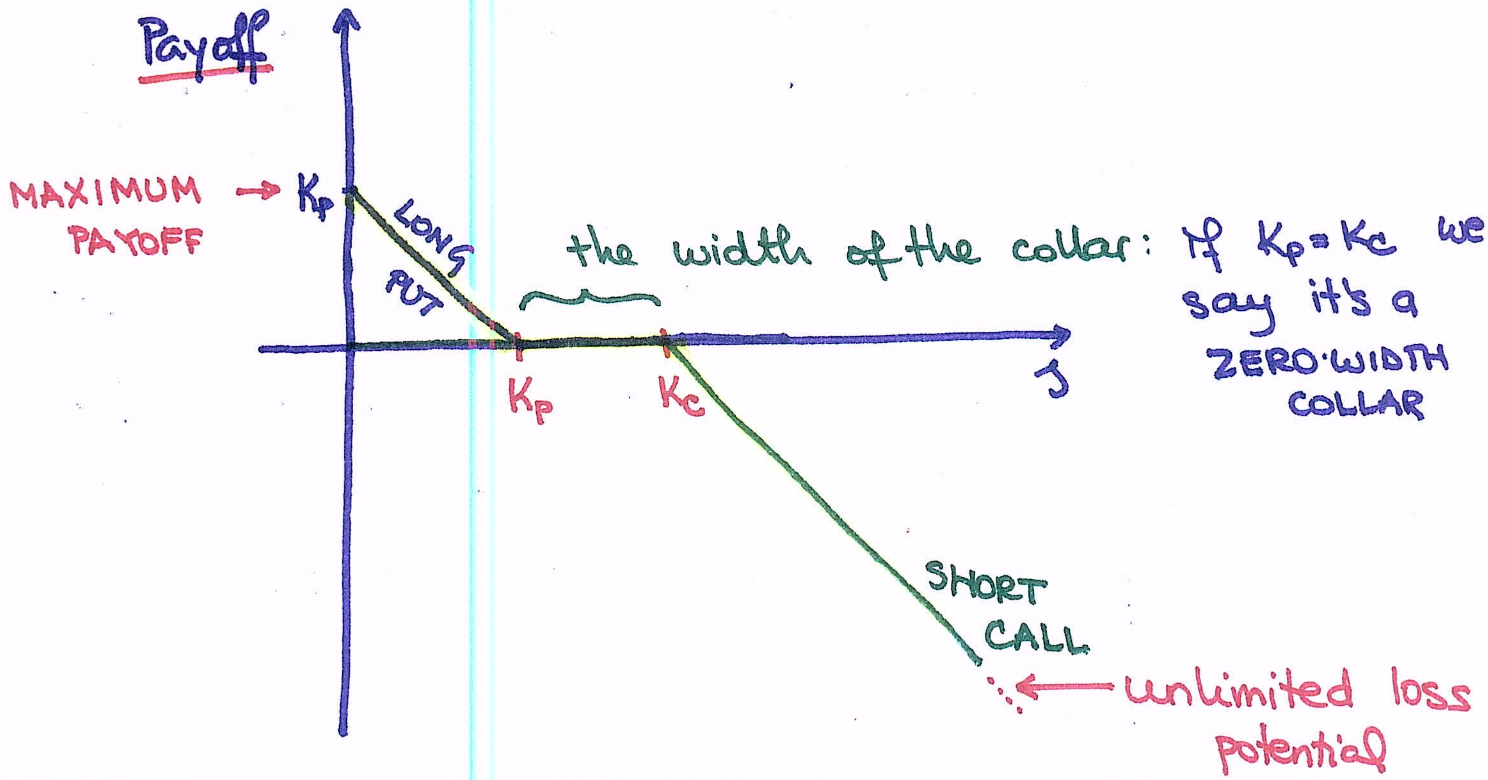
X (E) The call option is out-of-the-money, but the put option is in-the-money.

COLLAR.

- a <u>long</u> PUT w/ strike K_p
- a <u>written</u> CALL w/ strike K_c

such that $K_p \leq K_c$

and the options have the same underlying and the same exercise date T.



A <u>long</u> collar is a short position w/ respect to the underlying. ⇒ It should be a suitable hedge for a <u>long</u> position.