02/12/2018.

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

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: 100
- Strike price of the put option: 130
- Put option premium: 7
- Annual effective risk free rate: 3%

the put payoff

$V_P(1) \sim$???

In general:

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

$$\Downarrow$$

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

Calculate the expected profit of the put option.

(A) 12.79
(B) 15.89
(C) 22.69
(D) 27.79
(E) 30.29

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

Expected Profit $= 37.5 - 7(1.03)$

$= 30.29 \Rightarrow$ (E.)

63.

DELETED

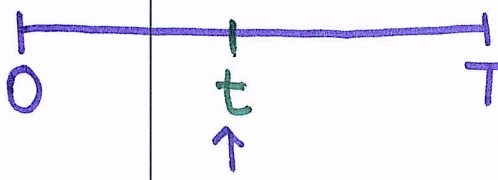
64.

DELETED

1.

Moneyness.

Consider an option:



Imagine what would happen if the option were to be exercised @ that time:

- if cashflow
  - >0, we say the option is **in the money**
  - $=0$, " " **at the money**
  - <0, " " **out of the money**

Usage:

* Let a call/put option be AT-THE-MONEY w/ exercise date T ....
  → this means that it is at-the-money when written, i.e.,
  - for a call: $S(0) - K = 0 \Rightarrow \boxed{S(0) = K}$
  - for a put: $K - S(0) = 0 \Rightarrow \boxed{S(0) = K}$

* Consideration of early exercise for American or 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.

$K_A - S(t) > 0$, i.e., $70 > S(t) \Rightarrow 80 > S(t)$

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

X (B) If Option A is at-the-money, then Option B is out-of-the-money. ($70 = S(t)$)

X (C) If Option A is in-the-money, then Option B is out-of-the-money. → Opposite to (A)

X (D) If Option A is out-of-the-money, then Option B is in-the-money. Take $S(t) = 81$: Counter example!

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

↳ Take $S(t) = 75$: Counterexample!

66.

$S(0)$

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

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

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

X (B) Both the call and put options are in-the-money.

X (C) Both the call and put options are out-of-the-money.

T (D) The call option is in-the-money, but the put option is out-of-the-money. $80 - 65 = 15 > 0$

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

Collar.

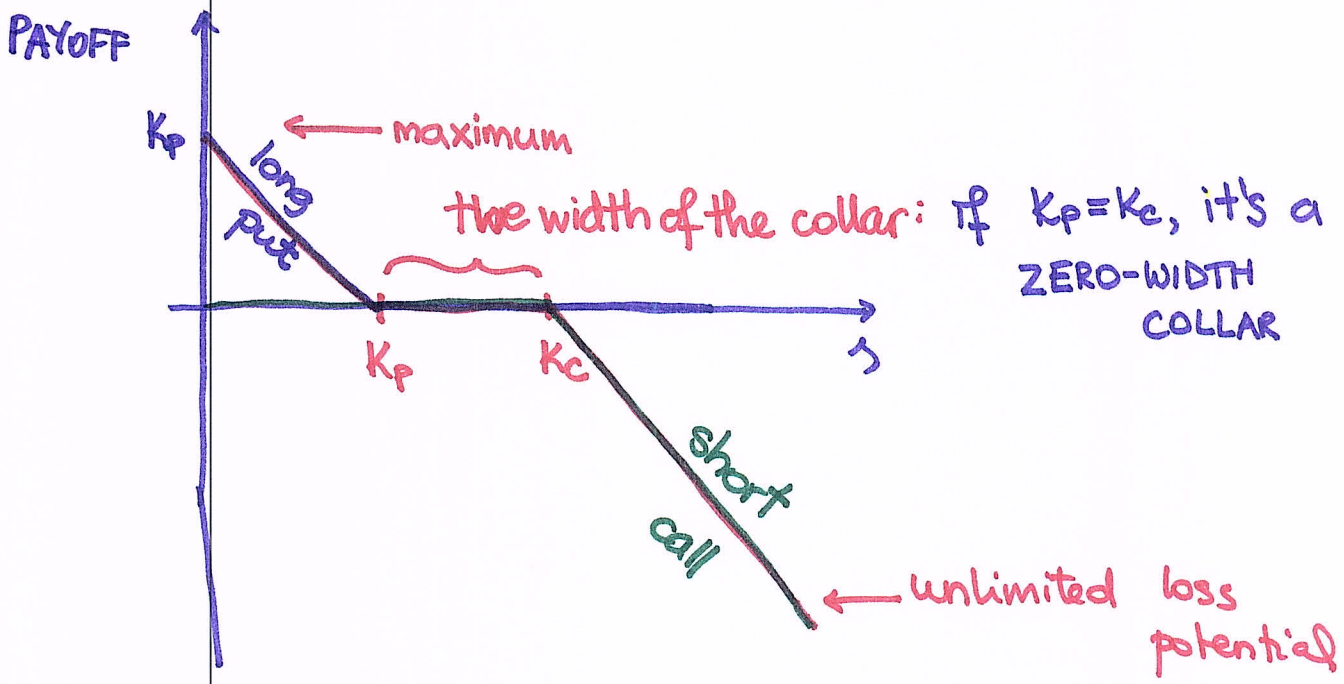
$$K_p \leq K_c$$

- long a put option w/ strike K_p

and

- write a call w/ strike K_c

on the same underlying asset & w/ the same exercise date.

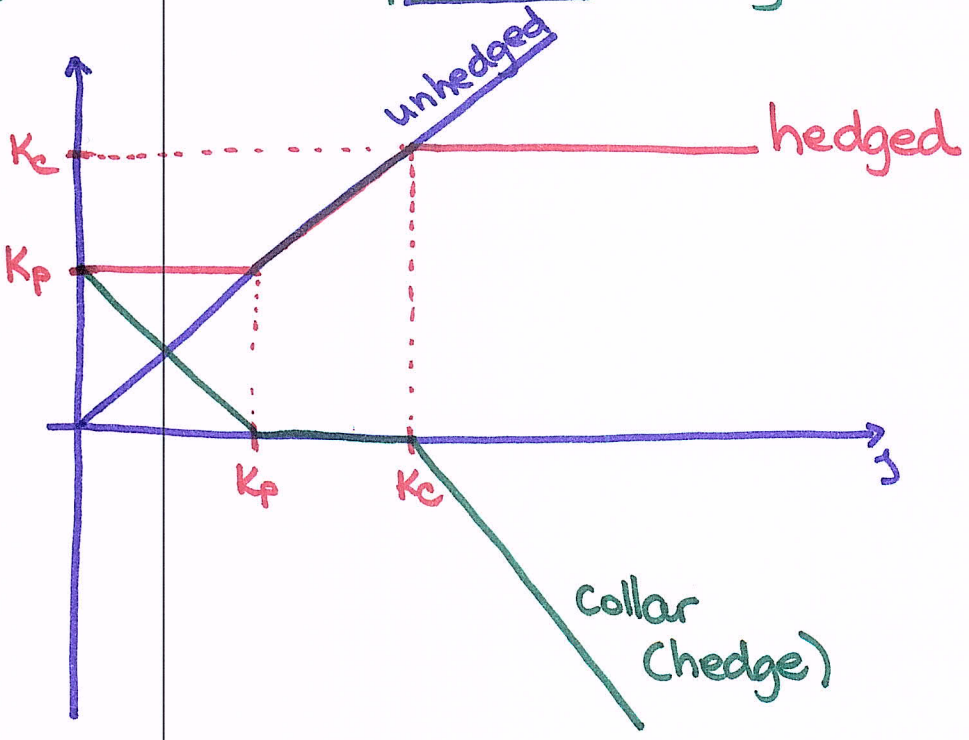


Short position w/ respect to the underlying.

=> We would use it to hedge a LONG position.

Hedging a long position using a collar.

Payoff



=> Payoff is between K_p and K_c, i.e., the range of the payoff is $[K_p, K_c]$.

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Problem set 1

Collars.

Problem 1.1. Sample FM (Derivatives Markets): Problem #3.
Happy Jalapeños, LLC has an exclusive contract to supply jalapeño peppers to the organizers of the annual jalapeño eating contest. The contract states that the contest organizers will take delivery of 10,000 jalapeños in one year at the market price. It will cost Happy Jalapeños 1,000 to provide 10,000 jalapeños and today's market price is 0.12 for one jalapeño. The continuously compounded risk-free interest rate is 6%.

Happy Jalapeños has decided to hedge as follows (both options are one year, European):

collar {
(1) buy 10,000 0.12-strike put options for 84.30, and
(2) sell 10,000 0.14-strike call options for 74.80.

Happy Jalapeños believes the market price in one year will be somewhere between 0.10 and 0.15 per pepper. Which interval represents the range of possible profit one year from now for Happy Jalapeños?

A. 200 to 100
B. 110 to 190
C. 100 to 200
D. 190 to 390
E. 200 to 400

TOTAL ACCUMULATED COST

Payoff range:

$$[10{,}000 \times 0.12 - 1000 \;,\; 10{,}000 \times 0.14 - 1000] =$$

$$= [200, 400]$$

Initial cost: $84.30 - 74.80 = 9.50$

$$FV_{0,1}(9.50) = 9.50e^{0.06} = 10.08704$$

$\Rightarrow$ Profit range: $[190, 390] \Rightarrow$ (D.) ■

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Problem set 1

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C. 100 to 200
D. 190 to 390
E. 200 to 400

Payoff bounds: cost

$$\left[10{,}000 \times 0.12 - 1000,\ 10{,}000 \times 0.14 - 1000\right]$$

$$= [200, 400]$$

Initial Cost: $84.30 - 74.80 = 9.50$

$$FV_{0,1}(9.50) = 9.50e^{0.06} \approx 10.0874$$

=> Profit bounds: $[190, 390]$ => (D.) ■