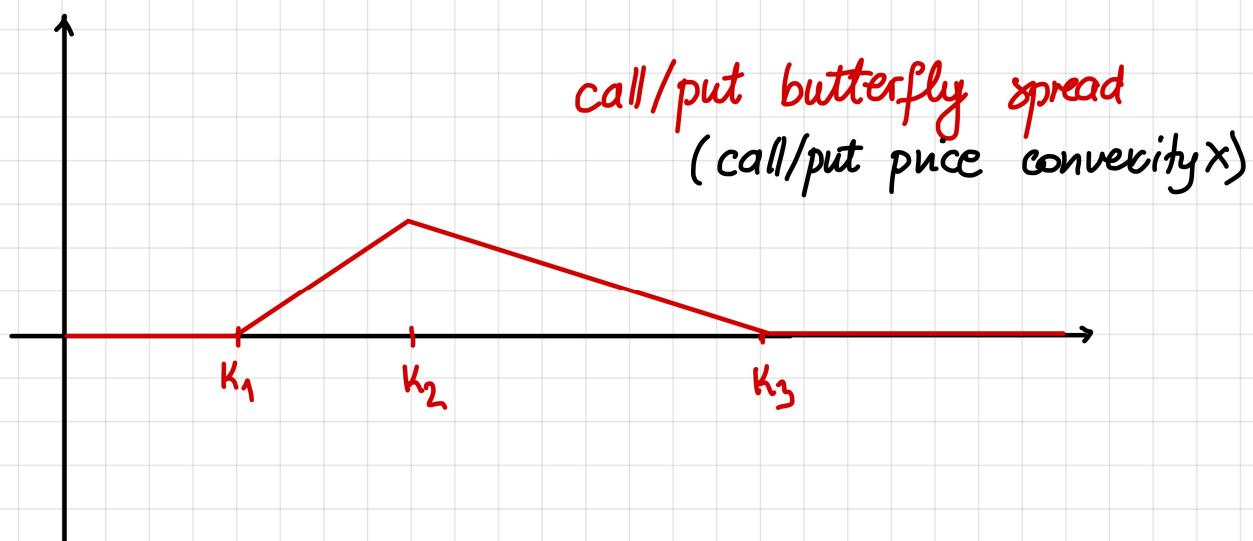
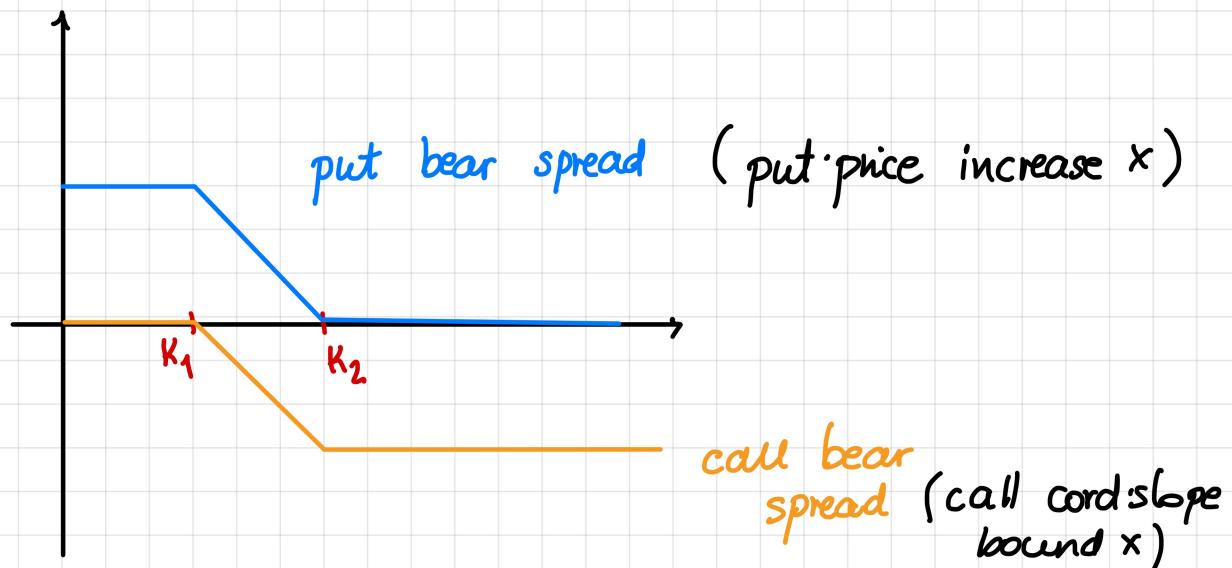
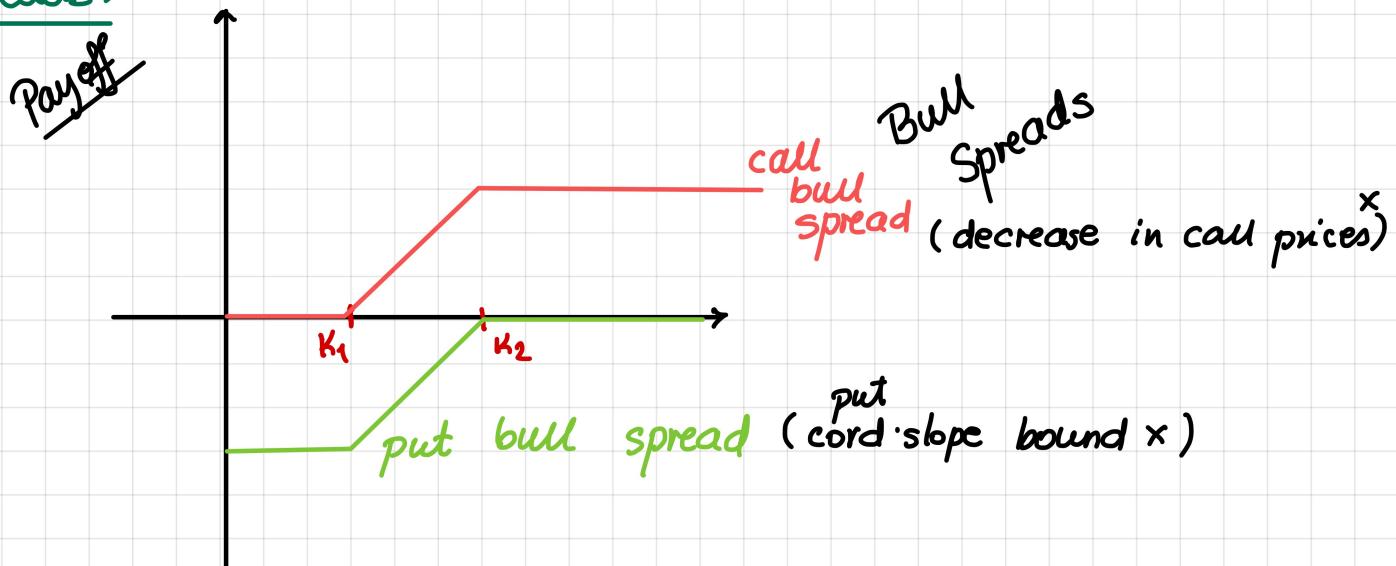


M339②: April 23rd, 2021.

Spreads.



9.

Stock ABC has the following characteristics:

- The current price to buy one share is 100. $S_0 = 100$
- The stock does not pay dividends.
- European options on one share expiring in one year have the following prices:

Strike Price	Call option price	Put option price
90	14.63	0.24
100	6.80	1.93
110	2.17	6.81

A butterfly spread on this stock has the following profit diagram.

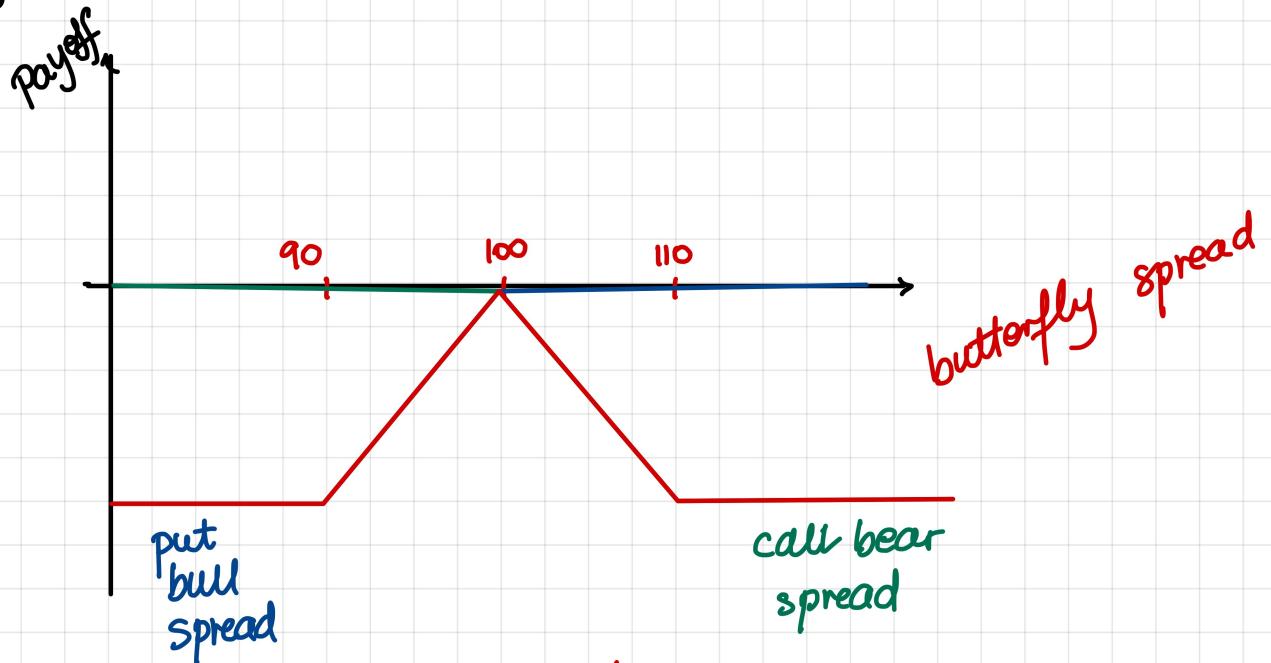


The continuously compounded risk-free interest rate is 5%.

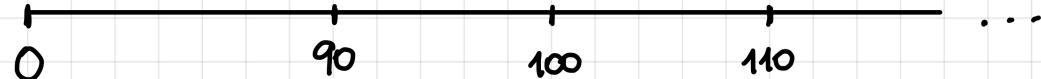
Determine which of the following will NOT produce this profit diagram.

- ☺ (A) Buy a 90 put, buy a 110 put, sell two 100 puts) ✓
- ☺ (B) Buy a 90 call, buy a 110 call, sell two 100 calls
- ☺ (C) Buy a 90 put, sell a 100 put, sell a 100 call, buy a 110 call
- (D) Buy one share of the stock, buy a 90 call, buy a 110 put, sell two 100 puts
- ☺ (E) Buy one share of the stock, buy a 90 put, buy a 110 call, sell two 100 calls.

- (C)
- buy a 90·put
 - sell a 100·put
 - sell a 100·call
 - buy a 110·call
- }
- put·bull spread ✓
- }
- call·bear spread ✓



(D) slope of the payoff curve: ✓



Long stock	+1	+1	+1	+1
Long 90·call	0	+1	+1	+1
2 short 100·puts	+2	+2	0	0
Long 110·put	-1	-1	-1	0
<u>Total Portfolio</u>	+2			
	0	⇒ Does not replicate a butterfly spread!		

(E) { Long stock }
 { Long 90-call }
 { Long 90-put }
 { 2 short 100-calls }
 { Long 110-call }

Long 90-call
 butterfly spread

Put call parity: (no dividends)

Long call
 +
 Short Put

\Leftrightarrow

long stock
 +
 short bond

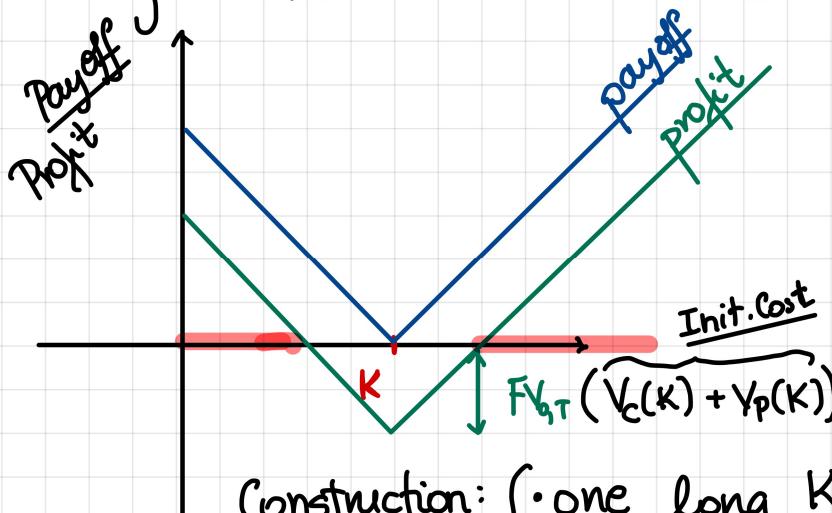
"synthetic" call = Long stock + long put + short bond

does not affect
the profit

Speculating on Volatility.

If one wants to speculate on low volatility, they should use a long butterfly spread.

If you want to speculate on high volatility, you should use: a straddle or a strangle.



Straddle

the payoff f'ction:

$$v(s) = |s - K|$$

$$= \underbrace{(s-K)_+}_{v_c(s)} + \underbrace{(K-s)_+}_{v_p(s)}$$

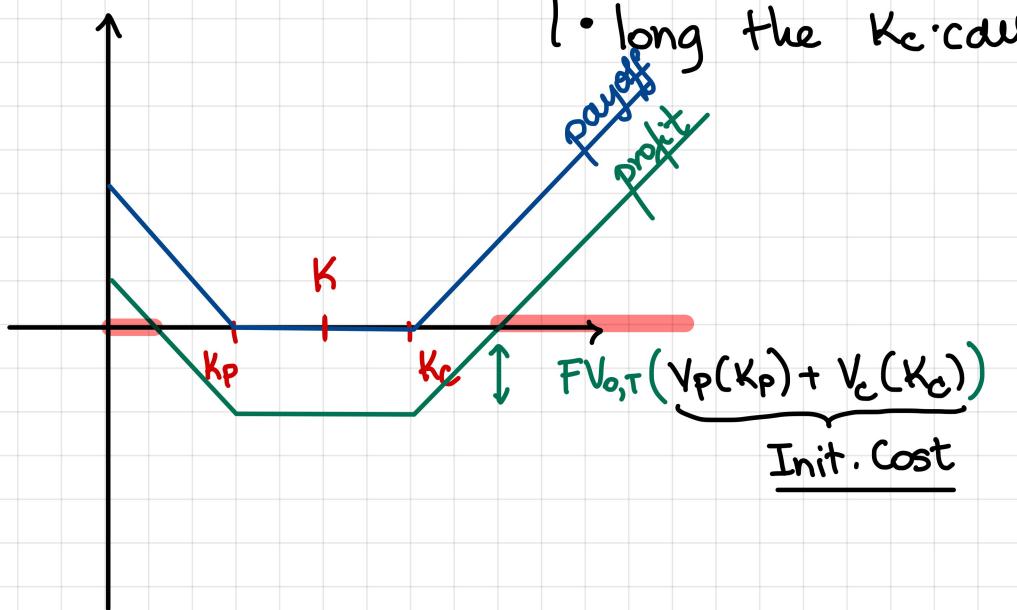
Construction: { · one long K-call }
 { · one long K-put }

Strangle (again, we want to bet on high volatility,
but w/ a lower initial cost)

Take

$K_p < K_c$, then : {

• long the $K_p \cdot \text{put}$
• long the $K_c \cdot \text{call}$



Q: Convince yourselves that for $K_p < K < K_c$ the straddle costs more than the strangle!