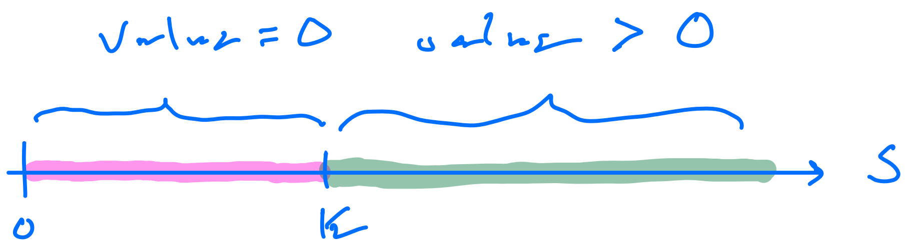
"Call" option

Right to buy a stock at a strike price K

If stock has price S, value (per share) of contract is:



Two missing pieces:

① contract has a price (per share) λ

② contract expires. λ should reflect chance of changes in S before expiration.

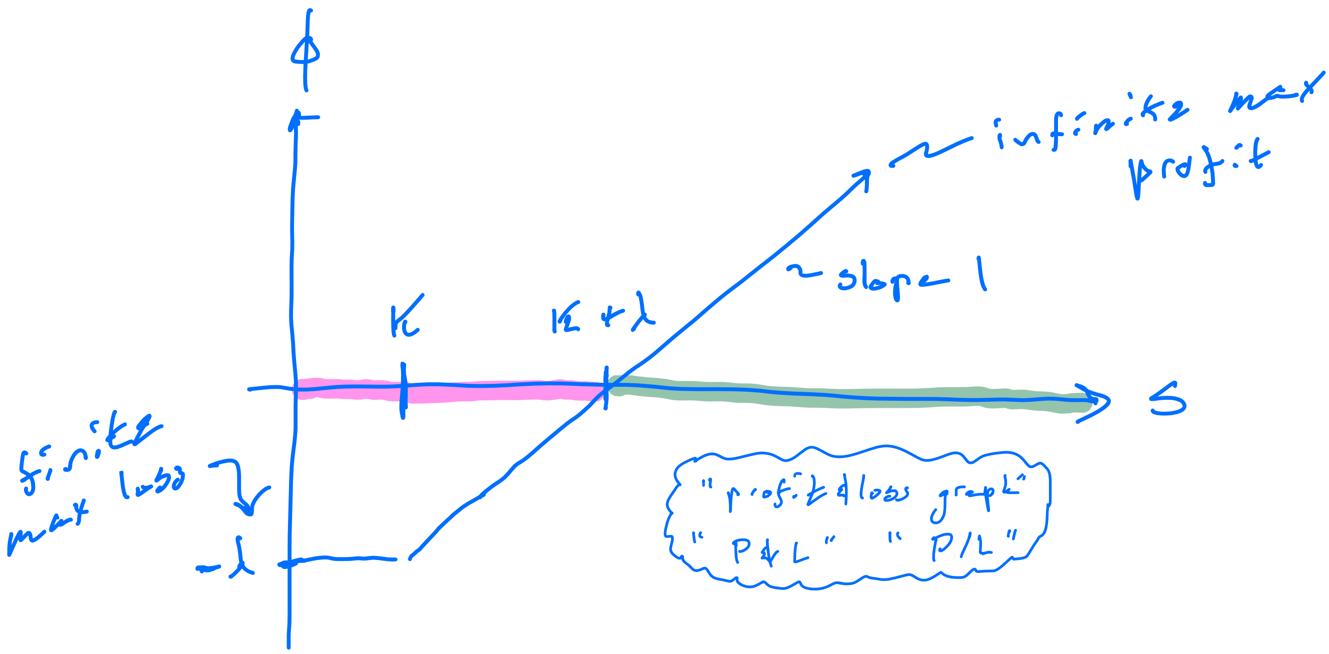
If you bought the option at

price λ, "cashing out" or exercising gives gain ϕ

$\phi > 0$ is profit

$\phi < 0$ is loss

generally: $\phi = \max(0, S-K) - \lambda$



When $S = K + \lambda$, $\phi = 0$. "Break even"

Will talk about another option with similar properties. To distinguish, subscript of c.

K_c : strike price of call

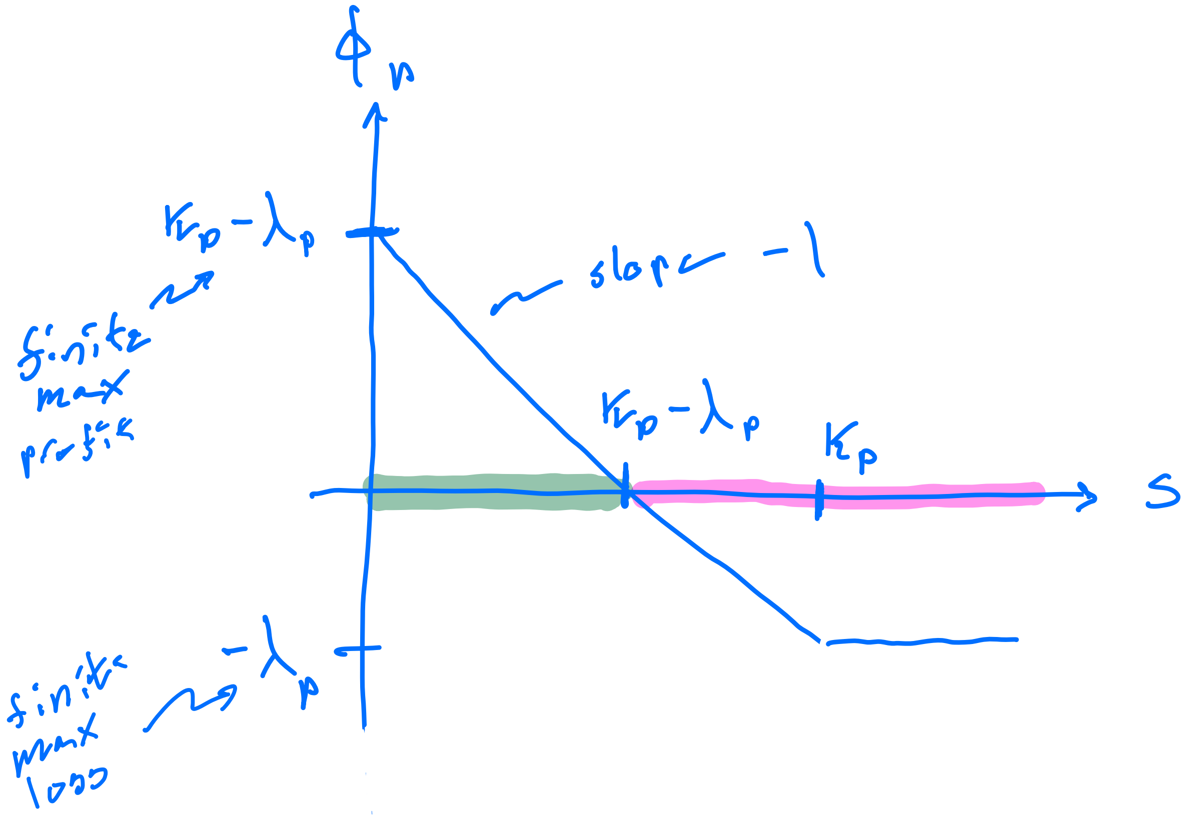
λ_c : cost per share of call

$\boxed{\text{"Put" option}}$

The right to sell a stock at strike price K_p.

If you bought contract at price per share λ_p, cashing out when stock is at price S gives gain

$$\phi_p = \max(0, K_p - S) - \lambda_p$$



$\boxed{\text{Strangle}}$

You buy a call and a put for total price per share $\lambda = \lambda_c + \lambda_p$

K_c = strike price of call

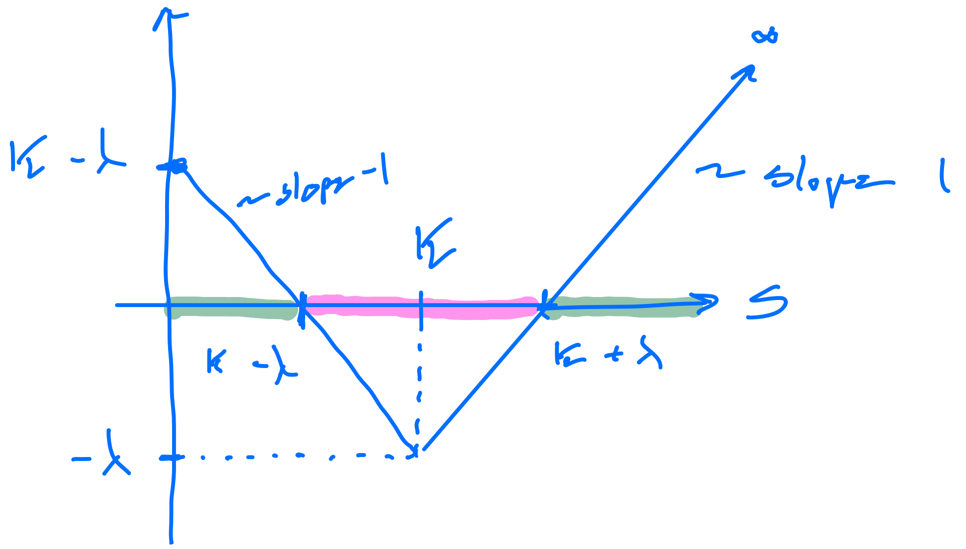
λ_c = cost per share of call

K_p = strike price of put

λ_p = cost per share of put

Example : $K_p = K_c = K$ "straddle"

$\phi = \phi_c + \phi_p$



There are two break even prices

$S_{LBE} = K - \lambda$ lower break even

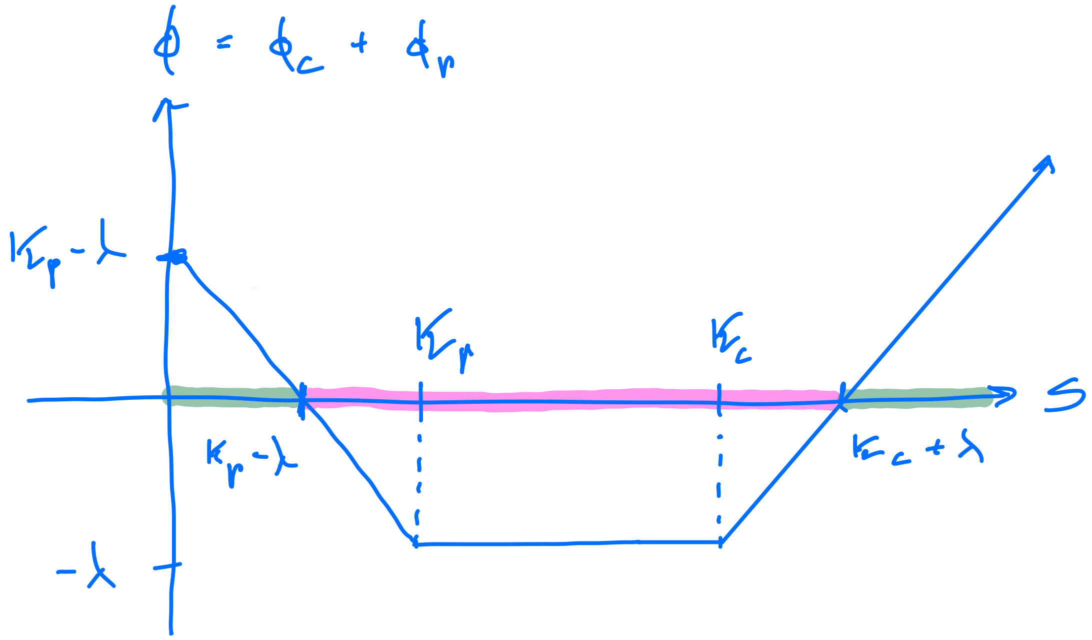
$S_{UBE} = K + \lambda$ upper break even

Max long profit : ∞ as $S \to \infty$

Max loss : $\lambda = \lambda_c + \lambda_p$ at $S = K$

Max short profit : $K - \lambda$ at $S = 0$

Example : $K_p < K_c$



There are two break even prices

$S_{LBE} = K_p - \lambda$ lower break even

$S_{UBE} = K_c + \lambda$ upper break even

Max long profit : ∞ as $S \to \infty$

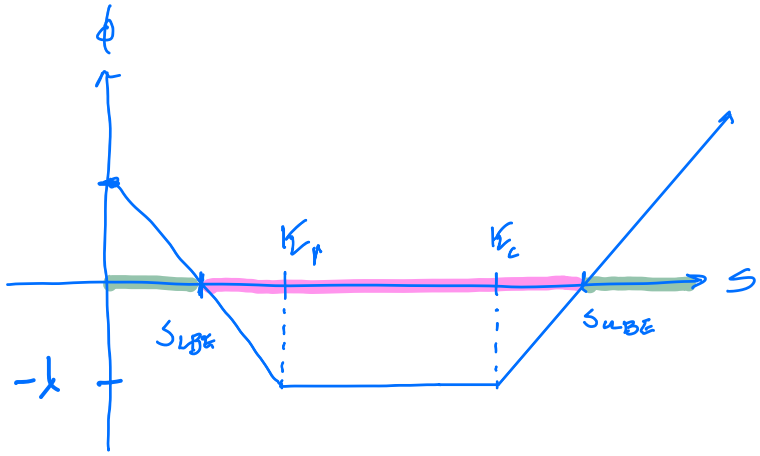
Max loss : $\lambda = \lambda_c + \lambda_p$ for $K_p < S < K_c$

Max short profit : $K_p - \lambda$ at $S = 0$

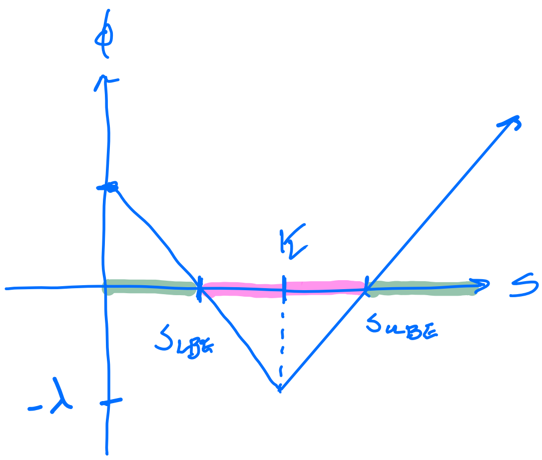
$\boxed{\text{Edgewalker idea}}$

Take last example, but move K_p and or K_c such that $K_p > K_c$ until

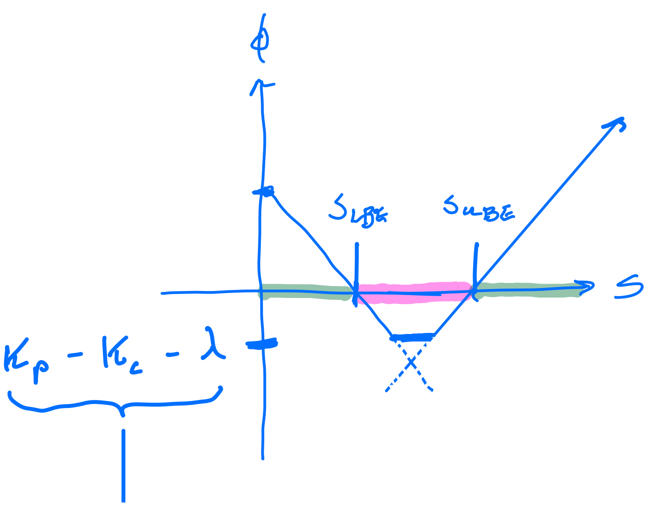
$S_{LBE} \geq S_{UBE}$



$K_p < K_c$



$K_p = K_c = K$



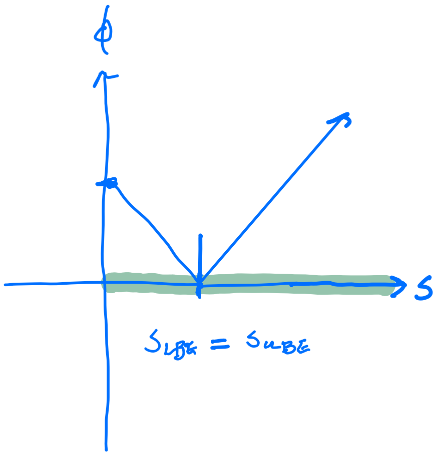
$0 < (K_p - K_c) < \lambda$

$$\phi_{min} = \begin{pmatrix}\text{cash out}\\ \text{put}\end{pmatrix} + \begin{pmatrix}\text{cash out}\\ \text{call}\end{pmatrix}$$

$$= (K_p - S) - \lambda_p + (S - K_c) - \lambda_c$$

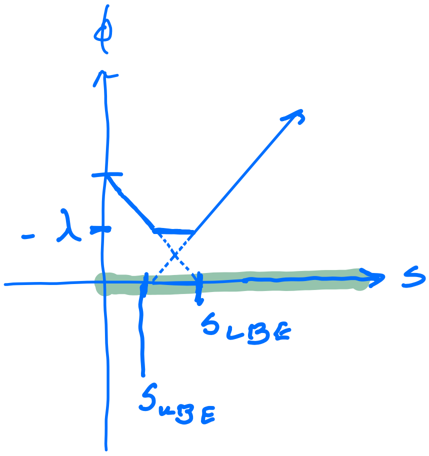
$$= K_p - K_c - \lambda$$

$\phi_{min} = 0$



$0 < (K_p - K_c) = \lambda$

$K_p - K_c - \lambda$



$\phi_{min} > 0$

$\lambda < (K_p - K_c)$

The last two cases are similar to an arbitrage in that there can be no loss, $\phi \geq 0$ for all S.

Could such a strangle be found? Not without adding other risk.

Suppose you buy a call & put for the same stock simultaneously. The contract costs are:

$$\lambda_c \geq \max(0, S - K_c) \geq S - K_c$$

$$\lambda_p \geq \max(0, K_p - S) \geq K_p - S$$

This means

$$\lambda = \lambda_c + \lambda_p \geq K_p - K_c$$

$$\Rightarrow \quad \underbrace{K_p - K_c - \lambda}_{\phi_{min}} \leq \Delta$$

So unless a contract has been badly mispriced, $\phi_{min} \leq \Delta$

However, If you buy the options at different times, so different underlying prices $S_c \neq S_p$

$$\lambda \geq S_c - K_c + K_p - S_p$$

$$\Rightarrow \quad K_p - K_c - \lambda \leq S_p - S_c$$

$$\phi_{min} \leq S_p - S_c$$

So if you wait (risk) until $S_p \gg S_c$, perhaps you can...

In other words, if you buy a put or call, then if your position becomes strong enough, you may find that a perfect (lossless) insurance comes to exist in the form of a companion call or put. Note:

* this reduce the likely gain of a strong position