pay off of a derivative.

Value of derivative at maturity.

Value : " Add on " value.

Call option: Strike price K, maturity T.

buy a stock with price K at maturity T.

sell ~~a~~ this Stock with price S_T

profit and loss: $S_T - K$

No exercise, profit and loss : 0.

when $S_T < K$.

In conclusion: profit and loss / pay off. is

$$(S_T - K)_+ = \max\{S_T - K, 0\}.$$

put option: sell a stock at strike price K.

If you have such a stock: sell the stock.

and you get K.

with put option : $K - S_T$ $K > S_T$

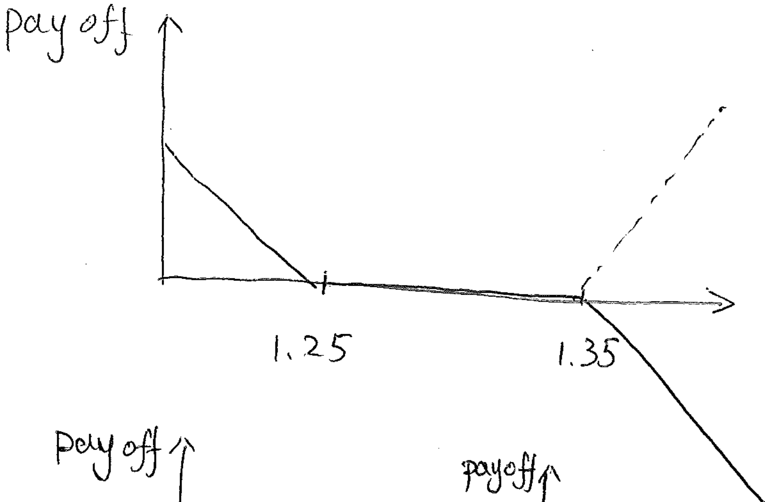
If you don't have such a stock.

with put option : $K - S_T$ $K > S_T$

pay off : $(K - S_T)_+$

4. X : exchange rate.

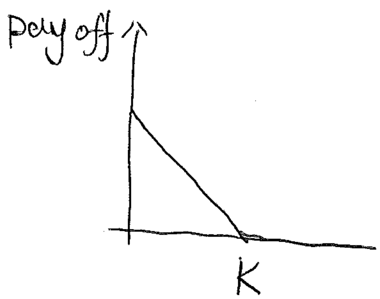
$$\text{payoff} = \begin{cases} 1.25 - X & X < 1.25 \\ 0 & 1.25 \leq X < 1.35 \\ 1.35 - X & X \geq 1.35 \end{cases}$$

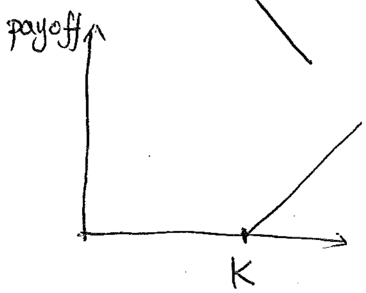


payoff

$(1.25 - X)_+ \quad - \quad (X - 1.35)_+$

Long put with strike $K = 1.25$. Short call with strike $K = 1.35$





2. Call option on futures

(b) T' : maturity of call.

T : delivery date of futures

time T', exercise the call option with strike K.

get a futures with the futures price K.

with this futures, I buy an asset at

T. with price K.

Only exercise the call option,

when I know $F(T', T) \geq K$.

Pay off : not realized at T', realized at T.

time T : Long position in a futures with futures price K.

enter a short position of a futures at time T' with futures price $F(T', T)$.

Long position: buy an asset with price K.

Short position : sell an asset with price $F(T', T)$.

$$P\&L : F(T', T) - K$$

Call option: payoff: at time T.

$$(F(T', T) - K)_+$$

put option.

pay off at delivery date T

$$(K - F(T', T))_+$$

		payoff at T
portfolio A:	• a call option.	$(F(T', T) - K)_+$
	• Cash at time 0. Ke^{-rT}	K
		+) $\max\{F(T',T), K\}$.

portfolio B:

• a put option.		$(K - F(T',T))_+$
• Futures	Long at time 0. with Futures price $F(0,T)$. Short at time T' with Futures price $F(T',T)$	$F(T',T) - F(0,T)$
• Cash position,	time 0 $F(0,T)e^{-rT}$	$F(0,T)$
		+) $\max\{F(T',T), K\}$.

$K > F(T',T)$

$$\begin{array}{rl} & K - F(T',T) \\ + & F(T',T) - F(0,T) \\ + & F(0,T) \\ \hline +) & K \end{array}$$

$K < F(T',T)$

$$\begin{array}{rl} & 0 \\ + & F(T',T) - F(0,T) \\ + & F(0,T) \\ \hline & F(T',T) \end{array}$$

Law of one price.

price at 0:

portfolio A: portfolio B:

$$C_0(F(0,T)) + Ke^{-rT} = P_0(F(0,T)) + 0 + \underline{\underline{F(0,T)e^{-rT}}}$$