

## Assignment 2.2

## Q4 European Put options

Put

Buy = \$3

Strike Price = \$42      Strike Price (K) = \$40

At maturity

$$\text{Payoff} = \max(0, K - S_T)$$

↓  
Stock Price at maturity

$$\begin{aligned} \text{Profit} &= \text{Payoff} - \text{Premium} \\ &= \max(0, K - S_T) - 3 \\ &= \max(0, 40 - S_T) - 3 \end{aligned}$$

$$40 - S_T - 3 > 0$$

$$37 - S_T > 0$$

$$S_T < 37$$

when stock price at maturity  
is less than (37)

Buy

(b) Put option when ITM condition -

$$K > S_T$$

$$\underline{40 > S_T} \rightarrow \text{for exercising this condition.}$$

(c) Case-I when  $S_T \geq 40$ 

$$\text{Payoff} = 0 \quad \text{Profit} = -3$$

Case-II when  $S_T = 37$ 

$$\text{Payoff} = 3 \rightarrow \text{Profit} = 0$$

Case-III when  $S_T < 37$ 

$$\text{Payoff} = 40 - S_T$$

$$\text{Profit} = 40 - S_T - 3$$

Q5 Portfolio of Forward + Put option

- ① Long-forward contract on asset.
- ② Long-European Put option with same  $(T)$  &  $(K) =$  as the forward price at setup.

 $S_T$  (at maturity) $F_0 \rightarrow$  forward price at setup.

\* For Forward contract

$$\text{Payoff at maturity} = \underline{S_T - F_0}$$

\* For Long European Put option at maturity.

$$\begin{aligned} \text{Payoff} &= \max(K - S_T, 0) \\ &= \max(F_0 - S_T, 0) \end{aligned}$$

$$\text{Portfolio complete Payoff} = S_T - F_0 + \max(F_0 - S_T, 0)$$

$$\textcircled{I} \text{ If } S_T \geq F_0$$

$$\text{Payoff} = S_T - F_0$$

$$\textcircled{II} \text{ If } S_T < F_0$$

$$\text{Payoff} = S_T - F_0 + F_0 - S_T = 0$$

~~Final Payoff~~

Pay off of European Call option

$$= \max(S_T - F_0, 0)$$

$$\text{If } S_T \geq F_0 \rightarrow S_T - F_0$$

$$S_T < F_0 \rightarrow 0$$

# Q6 Put Call Parity Risk Free Rate

Non-div

T = 12 months

$$K = \$120$$

$$\text{Call} = \$20 \text{ \& Put} = \$5$$

$$S_0 = \$130$$

1

current price

By Put-Call Parity

Protective Put =

fiduciary call

$$S_0 + P_0$$

$$=$$

$$C_0 +$$

$$\frac{K}{(1+r_f)^T}$$

$$130 + 5$$

$$=$$

$$20 +$$

$$\frac{120}{(1+r_f)^1}$$

$$115 = \frac{120}{(1+r_f)}$$

$$115 = \frac{120}{(1+r_f)}$$

$$1+r_f = \frac{120}{115}$$

$$r_f = 0.043$$

Implied risk free rate

4.3% per annum

$$\text{Profit} = (F_0 - S) \times 100$$

or loss.

$$F_0 = \$2050$$

$$\text{for } 1400 = S$$

$$\text{Profit} = (2050 - 1400) \times 100$$

$$\text{we can} = \$65,000$$

Similarly for all calculate



Q3 (a) corn futures (long)

$$\begin{aligned}\text{Profit} &= (\$5.80 - \$5.20) \times 5000 \\ &= 0.60 \times 5000 \\ &= \$3000\end{aligned}$$

(b) Coffee Futures (short)

$$\begin{aligned}\text{Profit} &= (\$1.60 - \$1.40) \times 0.37500 \\ &= 0.20 \times 37500 = \underline{\underline{\$7500}}\end{aligned}$$

(c) SPZ 200 futures (short)

$$\begin{aligned}\text{Profit} &= (\$7300 - \$7800) \times 40 \times 25 \\ &= -\$200,000 \text{ (Loss)}\end{aligned}$$

(d) Stainless Steel (long)

$$\begin{aligned}\text{Profit} &= (\$13500 - \$15000) \times 5 \times 3 \\ &= -\$22,500 \text{ (Loss)}\end{aligned}$$