

(Final 2018

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①

Q1. (i) $S_T < 30$, $S_T \geq 30$.

2. call 0. $2(S_T - 30)$

(i) $S_T > \$35$

put 30 - S_T 0.

(ii) $S_T \leq \$20$

portfolio $30 - S_T - 2C - P = 2(S_T - 30) - 2C - P$

$30 - S_T - 2C - P > 0 \Rightarrow S_T < 20$

$2S_T - 60 - 2C - P > 0 \Rightarrow S_T > 35$.

Q2. sell contract, when daily settlement.

$1012 - 2010 = \$2$.

Daily gain and loss is

Loss = $2 \times 100 = 200$.

Margin account is $2000 - 200 = 1800$

$1800 > 1500$,

thus, Margin account is $\$1800$.

Q3. Q. Forward can't be settled daily.

Q4. $1000 \times (T_2 - T_1) \cdot (R_2 - R_1) e^{-RT_2} = 1000 \times 0.5 \times 0.02 \times e^{-0.06 \times 2.5} = \8.61 .

8.61

Q5: 3-month, $K=40$, $r=8\%$, Compounding. $F_0 = 42$. ②

$$\cancel{F_0 - S_0} \quad \cancel{F_0 - K}$$

$$f = (42 - 40) e^{-0.08 \times \frac{3}{12}} = 1.96039 \quad \begin{matrix} 1.96 \\ \approx 1.96 \end{matrix} \quad \begin{matrix} -1.96 \\ \end{matrix}$$

because it's a short contract, its value is $-\$1.96$

Q6.



$$\text{Number} = \frac{2400000 \times 5.5}{110000 \times 6.0} = 200$$

Q7

$$a) \$102.61 = 3 \cdot e^{-0.05 \times 0.25} + 3 \cdot e^{-0.05 \times 0.75} + 103 e^{-0.05 \times 2.25} \quad \begin{matrix} 102.61 \\ - \end{matrix}$$
$$\approx 102.6118$$

$$b) 0.5 \times 7\% \times 100 = 35$$

$$\text{Bound} = 3.5 + 100 = 103.5$$

$$\text{Value of floating rate bond} = 103.5 \cdot e^{-0.05 \times 0.25} \quad \begin{matrix} 102.21 \\ - \end{matrix}$$
$$= \cancel{103.5} \cdot 102.21$$

$$c) \cancel{\text{value of payment} = 100} \times (3 - 3.5) \times e^{-0.05 \times 0.25} = -0.49 \quad \begin{matrix} -0.49 \\ \end{matrix}$$
$$\sqrt{e^{0.25}} - 1 = 0.025315$$

$$d) (3 - 2.5315) \times e^{-0.05 \times 0.75} = 0.45 \quad \begin{matrix} 0.45 \\ \end{matrix}$$

$$e) (3 - 2.5315) \times e^{-0.05 \times \frac{15}{12}} = 0.44 \quad \begin{matrix} 0.44 \\ \end{matrix}$$

$$f) -0.49 + 0.44 + 0.45 = 0.4 \quad \begin{matrix} 0.4 \\ \end{matrix}$$

Q8.

- a) Strike price $20/5=4$. Number of shares $= 100 \times 5 = 500$ $\frac{4}{16} \frac{500}{125}$ (3).
- b) Strike price $20/1.25=16$, $n = 100 \times 1.25 = 125$ $\frac{16}{20} \frac{125}{100}$
- c) Cash dividend has no effect.

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European call. $K=30$, $C_P=6$, $S_0=51$, $r=6\%$, $T=1$

put-call parity

$$C + K \cdot e^{-rt} = P + S_0$$

$$\underline{2.09}$$

$$P = C + K e^{-rt} - S_0$$

$$\underline{= 2.09}$$

o.

3-month call $K=28$, $C=2$

3-month put $K=20$, $C=3$.

$$\text{Profit} = (S - 28) + -2 + (20 - S) + -3$$

$$\underline{30} \quad \underline{15}$$

$$\text{Profit} = 0 \quad \left\{ \begin{array}{l} S_1 = 30 \\ S_2 = 15 \end{array} \right.$$

Q11. $S_0 = 30$. $\rightarrow P_{up} = 36$. $P_{down} = 24$.

④

(i) $36 \Delta - 4 = 26 \Delta - 0 \Rightarrow \Delta = 0.4$

0.4

(ii) $P = \frac{e^{rt\Delta}}{u-d} = \frac{1 - \frac{24}{30}}{\frac{36}{30} - \frac{24}{30}} = 0.4$

~~0.4~~ 1.6

Value of call option = $4 \times 0.4 + 0 \times 0.6 = 1.6$

(iii) $K = 32$.

0.6

$-36 \Delta - 0 = -36 \cdot 0.6 \Rightarrow \Delta = 0.6$

(iv). put. = $C + K - S_0 = 3.6$.

3.6

(v). $P = 0.4$

0.4

Q12. C.

Q13. $1 \cdot e^{-0.03} - 0.91 \times e^{-0.05} \approx 0.1048$

0.1048

Q14. $\boxed{R^*}^{(17)} \quad 44.p^* + 34(1-p^*) = 40.e^{0.06 \times 0.5}$
 $p^* = \boxed{0.722} \quad 0.722$

(5) $\boxed{0.722} \quad 0.722$
 (3).
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27. $\boxed{0.81}$ cents
 37. 7.98 cents.

$\frac{0.81}{7.98}$

Q15. (3)
 a) Gamma neutral.
 $n \times 0.04 - 100 = 0.$
 $n = 2500, \text{ long}$

b) Delta neutral.
 ~~$n \times 0.6 + 2400 = 0$~~
 ~~$n = 2500$~~
 after the position delta is $2400 + 2500 \times 0.6 = 3900.$ 3900 short