WI3417TU
Kansmodellen voor Finance
Assignment 7

Lucas de Vries 1522442

October 25, 2011

Chapter 4, Exercise 1

a

$$
\begin{aligned}
V_3^P(HHH) &= 0 \\
V_3^P(HHT) &= 0 \\
V_3^P(TTH) &= 2 \\
V_3^P(TTT) &= 3.50 \\
V_2^P(HH) &= \max(0, 0.8*(0.5*0+0.5*0)) = 0 \\
V_2^P(HT) &= \max(0, 0.8*(0.5*0+0.5*2)) = 0.8 \\
V_2^P(TT) &= \max(3, 0.8*(0.5*2+0.5*3.50)) = 3 \\
V_1^P(H) &= \max(0, 0.8*(0.5*0+0.5*0.8)) = 0.32 \\
V_1^P(T) &= \max(2, 0.8*(0.5*1+0.5*3)) = 2 \\
V_0^P &= \max(0, 0.8*(0.5*0.32+0.5*2)) = 0.928
\end{aligned}
$$

b

$$
\begin{aligned}
V_3^C(HHH) &= 28 \\
V_3^C(HHT) &= 4 \\
V_3^C(TTH) &= 0 \\
V_3^C(TTT) &= 0
\end{aligned}
$$

$$\begin{aligned}
V_2^C(HH) &= \max(12, 0.8 * (0.5 * 28 + 0.5 * 4)) = 12.8 \\
V_2^C(HT) &= \max(0, 0.8 * (0.5 * 4 + 0.5 * 0)) = 1.6 \\
V_2^C(TT) &= \max(0, 0.8 * (0.5 * 0 + 0.5 * 0)) = 0 \\
V_1^C(H) &= \max(4, 0.8 * (0.5 * 12.8 + 0.5 * 1.6)) = 5.76 \\
V_1^C(T) &= \max(0, 0.8 * (0.5 * 1.6 + 0.5 * 0)) = 0.64 \\
V_0^C &= \max(0, 0.8 * (0.5 * 5.76 + 0.5 * 0.64)) = 2.56
\end{aligned}$$

c

$$\begin{aligned}
V_3^S(HHH) &= 28 \\
V_3^S(HHT) &= 4 \\
V_3^S(TTH) &= 2 \\
V_3^S(TTT) &= 3.50 \\
V_2^S(HH) &= \max(12, 0.8 * (0.5 * 28 + 0.5 * 4)) = 12.8 \\
V_2^S(HT) &= \max(0, 0.8 * (0.5 * 4 + 0.5 * 2)) = 2.4 \\
V_2^S(TT) &= \max(3, 0.8 * (0.5 * 2 + 0.5 * 3.50)) = 3 \\
V_1^S(H) &= \max(4, 0.8 * (0.5 * 12.8 + 0.5 * 2.4)) = 6.08 \\
V_1^S(T) &= \max(2, 0.8 * (0.5 * 2.4 + 0.5 * 3)) = 2.16 \\
V_0^S &= \max(0, 0.8 * (0.5 * 6.08 + 0.5 * 2.16)) = 3.296
\end{aligned}$$

d

The optimal times for the american put and call do not match up, which means that for the straddle, one of the two will have to be exercised sub-optimally. This makes the price less than the price of two options that can be exercised at their separate optimal times.

Chapter 4, Exercise 2

In order to make sure we have enough money to pay off the debt, we use delta-hedging to offset it. The trader should buy stocks equal to (the inverse of) the delta-hedging formula in order to compensate for any changes in option price. Furthermore, the put option should be exercised at its optimal excerise time, which can be calculated along the with the model.

By doing so, the interest rate is compensated for by the delta-hedging, and the loan can always be paid back at the optimal time (the price of the option is dependend on its value at the optimal time after all).