Problem Set 12 *

Ian McGroarty
Course Number: 555.444

November 19, 2019

*Problems:17.4.1, 17.22, 17.23, 18.7, 18.8, 18.5, 18.22

Problem 15.4. $S_0 = 0.80, k = 0.79, \sigma = 0.12, r = 0.06, r_f = 0.08, T = 4\ mon$ With these parameters we can find, $\delta t = 2$, $u = e^{\sigma \cdot \sqrt{\delta t}} = e^{0.12 \cdot \sqrt{2/12}} = 1.05$ and thus $d = 1/u = 1/(1.05) = 0.952$ and $a = e^{(r - r_f)\delta t} = e^{(0.06-0.08)*2} = 0.961$. We can now find $p = \frac{a-d}{u-d} = \frac{0.961-0.952}{1.05-0.952} = 0.454$ The binomial tree show below shows the value of the European call and American Call options.

		0.88235
		0.09235
	0.84017	
	0.047	
0.8		0.8
0.024		0.01
	0.76175	
	0.004	
		0.73
		0.000

(a) European Call

		0.88235
		0.09235
	0.84017	
	0.050	
0.8		0.8
0.025		0.01
	0.76175	
	0.004	
		0.73
		0.000

(b) American Put

Problem 17.22. Can an option on the yen-euro exchange rate be created from two options, one on the dollareuro exchange rate, and the other on the dollar-yen exchange rate? Explain your answer.

Okay so the obvious answer here is yes and the way to do it would be to, first buy a call sell a put on dollar-yen rates then do the same for euro-yen rates. But I want to talk about this a different way that I makes more sense to me. It must be the case that the following holds:

$$\frac{Yen}{Dollar} \cdot DollarEuro = \frac{Yen}{Euro}$$

The arbitrage opportunities available if this equality were not true are fairly obvious. So the must exist a series of options fixing the exchange rates against the dollar that allow you to fix the exchange rate to the Yen/Euro.

Problem 17.23. DerivaGem

Problem 18.7. adfgasdf

Problem 18.8. Suppose you buy a put option contract on October gold futures with a strike price of \$1400 per ounce. What happens when you exercise for \$1380.

You'll get a futures contract $+\ (1400 - 1380) * 100 = \$2,000$ cash money.

Problem 18.15. $F_0 = 70, \sigma = 20\%, r = 0.06, K = 65$.

$$
\begin{aligned}
d_1 &= \frac{ln(F_0/K) + (\sigma^2/2)(T)}{\sigma\sqrt{T}} && \text{(pg 388)} \\
&= \frac{ln(70/65) + (0.2^2/2)((5/12))}{0.2\sqrt{(5/12)}} = 0.6386 \\
d2 &= d_1 - \sigma\sqrt{T} \\
&= 0.6386 - 0.6\sqrt{5/12} = 0.5905 \\
p &= e^{-rT}[KN(-d_2) - F_0N(-d_1)) && \text{Eqn. 18.8 (pg. 388)} \\
p &= e^{-0.06*(5/12)}[65 \cdot N(-0.5905) - 70 \cdot N(-0.6386)] \\
p &= 1.498
\end{aligned}
$$

Problem 18.22. $F_0 = 40$ If is known that at the end of three months the price will be either 35 or 45. What is the value of a three month European call option an the futures with a strike price of 42 if the risk free interest rate is 7%?

$F_u \cdot u = 40 \cdot u = 45 \rightarrow u = 1.125 \rightarrow d = 0.875$ So, $p = \frac{1-d}{u-d} = 0.5$ So,

$$
\begin{aligned}
f &= e^{-rT}[p \cdot f_u + (1-p) \cdot f_d] && \text{Eqn. 18.9 (pg 391)} \\
f &= e^{-0.06(3/12)}[0.5 \cdot 45 + 0.5 \cdot 35] = 1.474
\end{aligned}
$$