University of Texas at Austin

Problem Set #11

Binomial option pricing: Currency options. Futures options.

Problem 11.1. Your goal is to price a call option on a futures contract. The movements of the futures price are modeled by a binomial tree. You are given:

(i) Each period is three months.
(ii) $u_F/d_F = 5/4$, where u_F is one plus the rate of gain on the futures price if it goes up, and d_F is one plus the rate of loss if it goes down.
(iii) The risk-neutral probability of an up move is 1/2.
(iv) The initial futures price is 80.
(v) The continuously compounded risk-free interest rate is 5%.

Find the price of a half-year, 85-strike European put option on the futures contract.

(a) $8.23
(b) $13.06
(c) $13.27
(d) $13.36
(e) None of the above.

Problem 11.2. The current futures price is given to be $80. The evolution of this futures price over the following year is modeled using a two-period binomial tree such that the ratio of the up factor to the down factor equals 4/3. Moreover, you are given that the risk-neutral probability of an up movement in the tree in any single step equals 1/3.

The continuously compounded risk-free interest rate is 0.05.

What is the price of a one-year, $85-strike European put option on the above futures contract consistent with our model?

(a) About $2.24.
(b) About $8.12.
(c) About $8.54.
(d) About $8.98.
(e) None of the above.

Problem 11.3. The current exchange rate is given to be \$1.11 per Euro and its volatility is given to be 0.16. The continuously compounded risk-free interest rate for the US dollar is 0.02, while the continuously compounded risk-free interest rate for the Euro equals 0.04.

The evolution of the exchange rate over the following nine-months is modeled using a three-period forward binomial tree. What is the value of the so-called up factor in the above tree?

(a) $u \approx 1.0779$
(b) $u \approx 1.0887$
(c) $u \approx 1.1503$
(d) $u \approx 1.1972$
(e) None of the above.

Problem 11.4. The current exchange rate is given to be \$1.25 per Euro and its volatility is given to be 0.15.

The continuously compounded risk-free interest rate for the US dollar is 0.03, while the continuously compounded risk-free interest rate for the Euro equals 0.06.

The evolution of the exchange rate over the following nine-month time-horizon is modeled using a three-period forward binomial tree.

What is the price of an at-the-money, nine-month European call option on the Euro?

(a) 0.0376
(b) 0.0531
(c) 0.0543
(d) 0.0602
(e) None of the above.