UNIVERSITY OF TEXAS AT AUSTIN

Extra-credit homework assignment 6

Binomial pricing of American options.

Please, provide your **complete solutions** to the following problems:

Problem 6.1. (10 points) Assume a nonnegative continuously compounded, risk-free interest rate. It is never optimal to exercise an American call option on a non-dividend paying stock early. *True or false? Why?*

Problem 6.2. (10 points) The current stock price is observed to be \$100 per share. The stock is projected to pay dividends continuously at the rate proportional to its price with the dividend yield of 0.03. The stock's volatility is given to be 0.23. You model the evolution of the stock price using a two-period forward binomial tree with each period of length one year.

The continuously compounded, risk-free interest rate is given to be 0.04.

What is the price of a two-year, \$101-strike **American** put option on the above stock consistent with the above stock-price tree?

Problem 6.3. (10 points) The current price of a non-dividend-paying stock is \$100 per share. A two-period binomial stock-price tree is used to model the movements of the stock price during the following year. The up and down factors are given to be $u = 1.2$ and $d = 0.9$.

The continuously compounded, risk-free interest rate equals 0.06.

Consider a \$110-strike, one-year American put on the above stock. Use the two-period binomial stock-price tree to calculate the current price of the American put.

Problem 6.4. (10 points) The current price of a non-dividend-paying stock is \$100 per share and its volatility is given to be 0.25.

The continuously compounded, risk-free interest rate equals 0.04.

Consider a \$110-strike, one-year American put on the above stock. Use a two-period forward binomial stock-price tree to calculate the current price of the American put.

Problem 6.5. (10 points) A certain non-dividend-paying stock is currently priced at \$100 per share. You assume that each year the price can either increase or decrease by 25%. Using this assumption, you construct a $2-$period binomial tree modeling the evolution of the stock price over the next two years.

Assume that the continuously compounded risk-free interest rate equals 5%.

Consider a two-year, \$90$-$strike American call option on the above stock. What is its time-0 value $V_C^A(0)$ as calculated using the above model for the stock price?