Assignment 1 - Math 799 Numerical Methods for Finance

20/01/2003

1. Using arbitrage arguments, prove the put-call parity relation

$$c_t + Xe^{-r(T-t)} = p_t + S_t,$$

where c_t and p_t are the prices at time t for respectively a call and a put option with the same strike price X and same maturity T, writen on a stock with price given by S_t .

2. In the same vein, prove that it is never optimal to exercise an American call option on a non-dividend paying stock. Discuss informally how the result is modified if the stock pays a known dividend yield before the matutity date for the option.

3. Use the routines LatticeEurCallCRR.m and LatticeAmPutCRR.m with 100 time steps to investigate how the price of European calls and American put options with strike price X = 50 written on an option with present value $S_1 = 50$ when depends on the volatility σ , the interest rate r and the time to maturity T. That is, choose some reference values for σ , r and T and then compute the price for the option for different values of each of these parameters separately, while keeping the others constant. Use the plot capabilities of MatLab to visualize your results (in the form of 6 pictures). Make sure to use sensible intervals; check in the literature what are the typical values for volatilities, interest rates and maturities encountered in practice