

MATH 194, HOMEWORK 3, DUE IN CLASS FRIDAY, APRIL 23

1. Given a bank interest rate of 5% per annum and a time period of 102 days, compute the price of a future based on a stock whose current price is 40.25.
2. Let S_t denote stock price at time t , r the bank interest rate. The Black-Scholes formula given in the notes specifies the price $E(S_T - x)^+$ of a European call option with strike price x , expiration date T , as a function of current stock price s , interest rate r , and volatility σ . Make an Excel spreadsheet that gives a plot of $E(S_T - x)^+$ as a function of σ , given that the interest rate is 3% per annum, and that $s = 50$, $x = 51$ and T is one quarter of a year into the future. Use the graph to estimate σ , if the current market price on the option is 3. (This is an example of *implied volatility*, where the volatility is estimated based on the market price of the European call option.) (Hint: the Excel function NORMSDIST gives values of the standard normal cdf.)
3. Use the Black-Scholes formula (with Excel, if you wish) to find the price of a European call option expiring in 3 months, given that the strike price is 70, the current price is 80, interest rate is 5%, and volatility is 0.3.
4. Using exactly the same assumptions as in the derivation of the Black-Scholes formula, compute the probability that a European call option ends up “in the money”, which is to say the probability that the option is profitably exercised at expiration. Use the usual meanings of the symbols r , T , x , S_0 , μ , σ .