

MA 374: FE-Assignment #09

Due on Monday, April 4, 2016

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PROBLEM 1

Similar to the one done in Lab-08, collect the data of option prices on some of the stocks that are included in NIFTY index for a time interval depending on the availability of data (going backwards from 8th March 2016). Choose the stocks such that they are from different industries and are already included in your database nsedata1. The data should comprise of closing prices of calls and puts of various maturities and strike prices. Put all these data in an Excel file and name it as stockoptiondata.

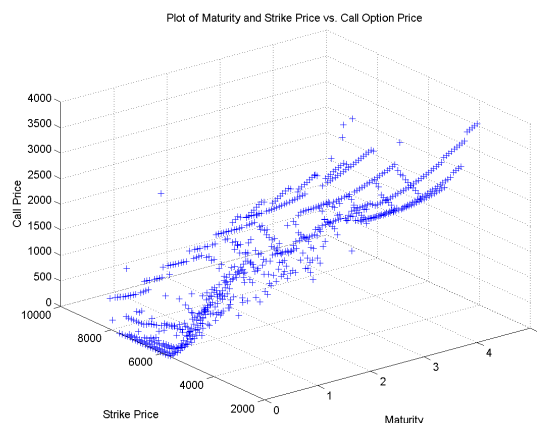
SOLUTION

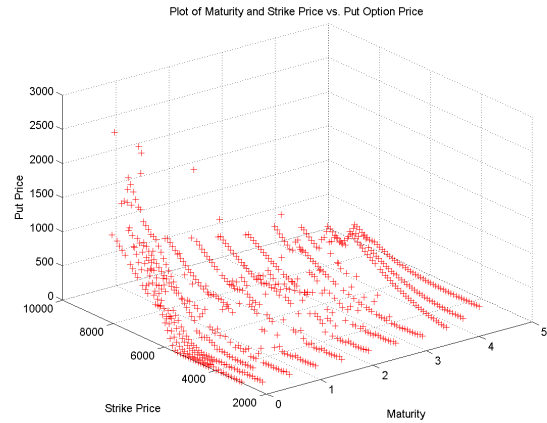
The excel file has been included along with all the other work files.

PROBLEM 2

Consider the data of option prices on NIFTY and on stocks stored in the Excel files NIFTYoptiondata and stockoptiondata. Take the current time to be $t = 0$ and S_0 to be the current index level or the current stock price. Assume $r = 5\%$.

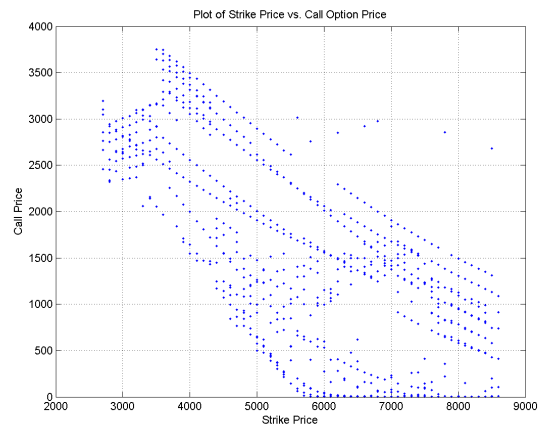
1. Plot the option prices (for both call and put) for a range of maturities and strike prices in three dimension. (Your plot axes are option price, maturity and strike price). If you visualize the above plot in two dimensions (option price vs. strike and option price vs. maturity) what do you observe ?
2. For each maturity and each strike, compute the implied volatility from the BSM formula using the appropriate root-finding method (eg. Newton-Raphson method). Plot the implied volatilities against strike price and maturity in three dimension. What are your observations if you examine the plot in two dimensions (implied volatility vs. strike and implied volatility vs. maturity) ?
3. Estimate the historical volatility for the same period for which you have estimated the implied volatility. How do the two volatilities compare ? Present your results in tabular and graphical forms. Note that when you are computing the historical volatilities, you have to take data starting from $t = 0$ and going back in time for a period equal to the maturity of the option.

SOLUTION**Part 1****3D PLOTS****Plot of Maturity and Strike price Versus Call Option Price****Plot of Maturity and Strike price Versus Put Option Price**

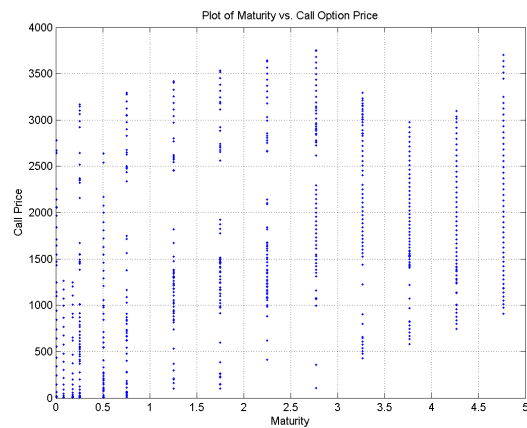


2D PLOTS

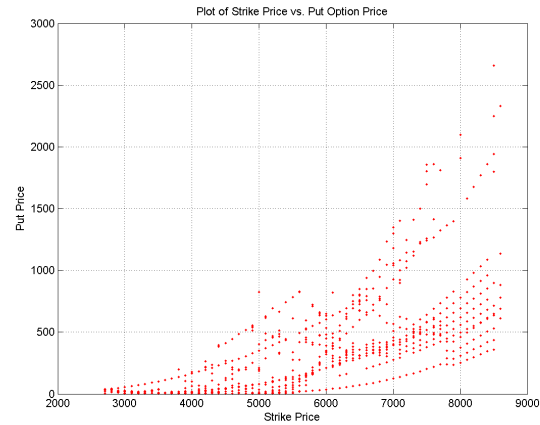
Plot of Strike price Versus Call Option Price



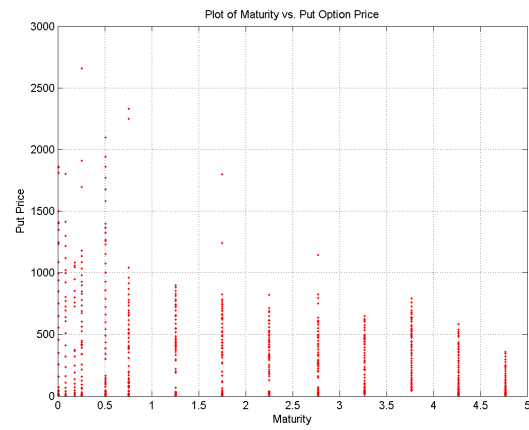
Plot of Maturity Versus Call Option Price



Plot of Strike price Versus Put Option Price

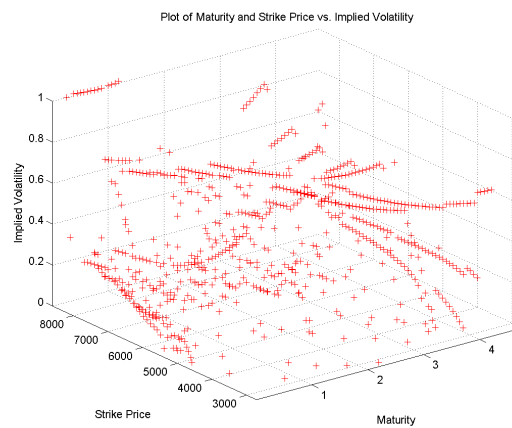


Plot of Maturity Versus Put Option Price

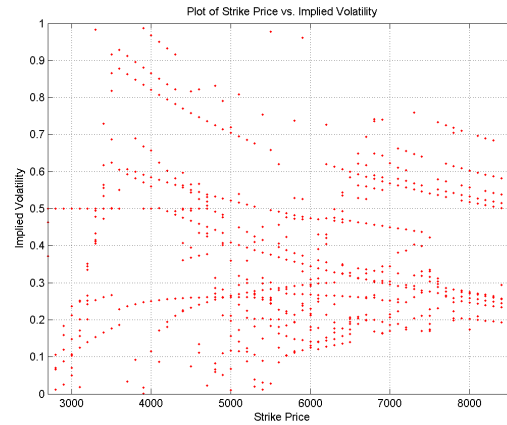


Part 2

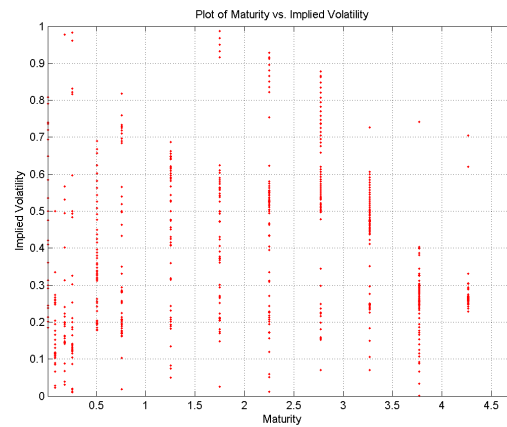
Plot of Maturity and Strike Price Versus Implied volatility



Plot of Strike Price Versus Implied volatility

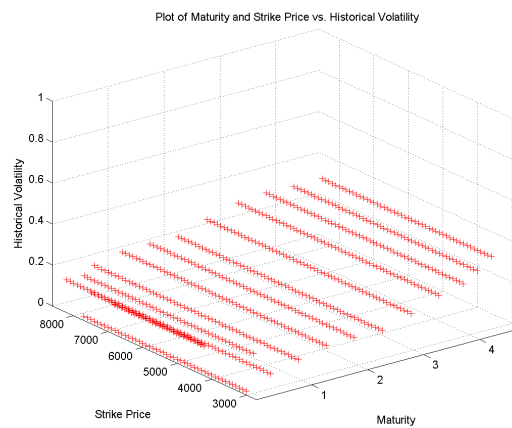


Plot of Maturity Versus Implied volatility

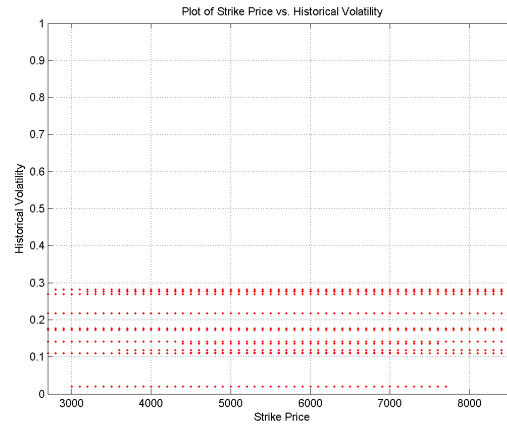


Part 3

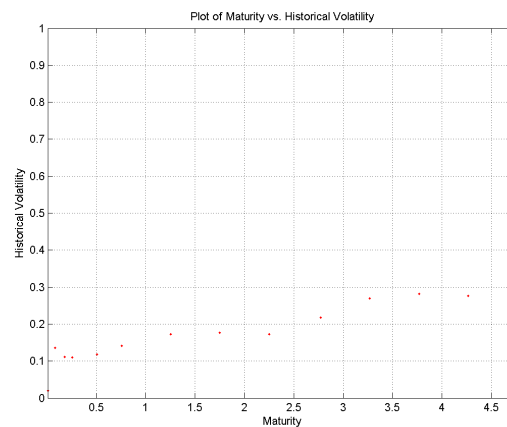
Plot of Maturity and Strike Price Versus Historical volatility



Plot of Strike Price Versus Historical volatility



Plot of Maturity Versus Historical volatility



From the above plots, it can be inferred that the historical and implied volatilities only match at some points (i.e a very small fraction of all the points at which the volatilities have been calculated).