FTS Real Time System Project: Interpreting the Prices of Stock Index Options

Question: Are the prices obtained through Black Scholes option pricing model the same as the real market prices?

Objectives

First, we need to clarify the above question because it is always possible to precisely match the market price by using the implied volatility from the option price. As a result, the point of this exercise is to independently estimate volatility and then ask the question whether the market prices of certain maturity and strike prices reflect your estimates for volatility.

The starting place for estimating volatility is from historical return data. This is easily available today from the web. However, we will work with monthly, weekly and daily price data to see which dataset provides the best estimates for volatility.

Step 1: For the index options you are working with download the historical price data into Excel. Here we will work with three types of price data:

i.   5-years of monthly data

ii.   2-years of weekly data

iii.   1-year of daily data

In the FTS Real Time Client double click on the underlying index in the ticker window and then click on Historical Prices in the top RHS of the screen. For the case of the S&P500 index this is:
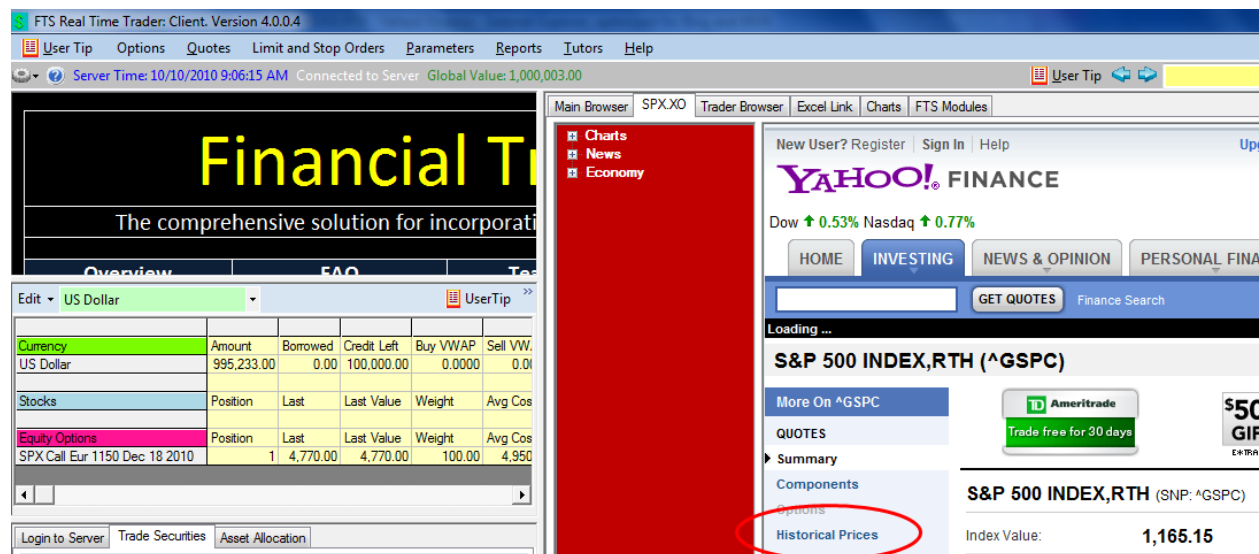
This will bring up the historical price screen and so to download Daily, Weekly and Monthly by setting the Start and End Dates and selecting Daily, Weekly or Monthly. Finally click on Get Prices
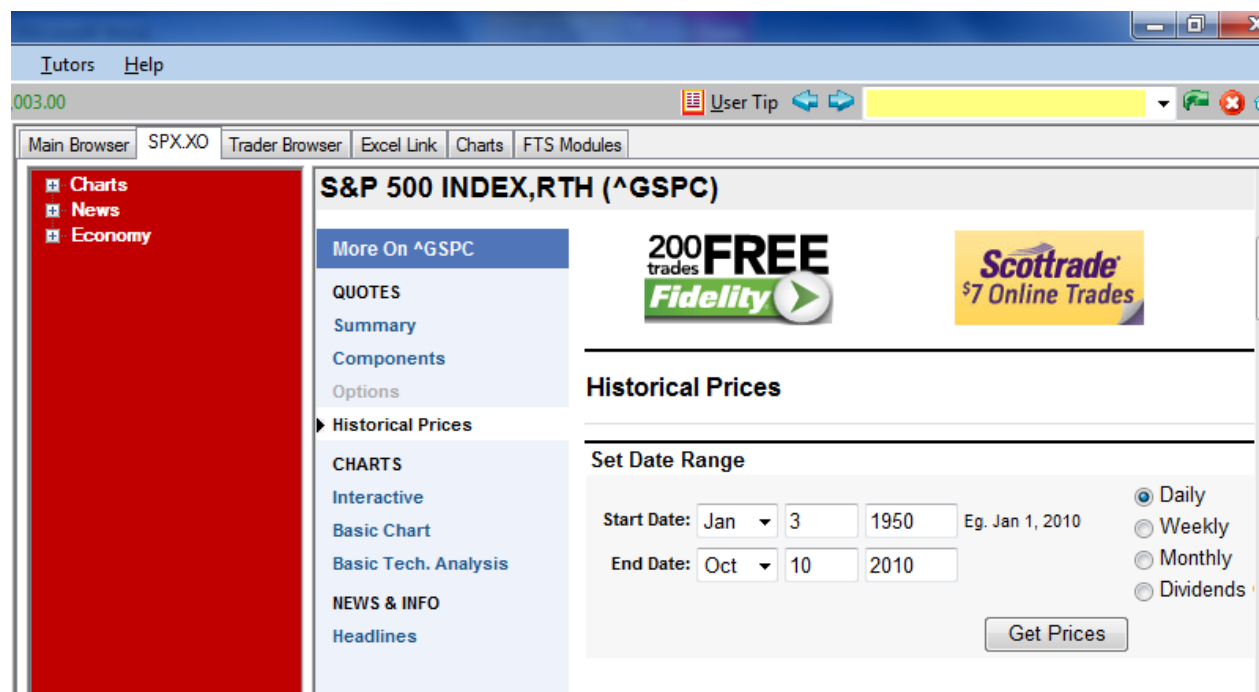
By clicking on Get Prices and scrolling to the end:

| Main Browser | SPX.XO | Trader Browser | Excel Link | Charts | FTS Modules |

⊞ Charts
⊞ News
⊞ Economy

Jul 14, 2010	1,095.61	1,099.08	1,087.68	1,095.17
Jul 13, 2010	1,080.65	1,099.46	1,080.65	1,095.34
Jul 12, 2010	1,077.23	1,080.78	1,070.45	1,078.75
Jul 9, 2010	1,070.50	1,078.16	1,068.10	1,077.96
Jul 8, 2010	1,062.92	1,071.25	1,058.24	1,070.25

* Close price adjusted for dividends and splits.

Download to Spreadsheet

You can download these prices to Excel.

Tip: When you save the .csv file for Excel be sure to name it appropriately

Repeat this three times by changing the dates and selecting Daily/Weekly/Monthly. Finally, you can clean up spreadsheet by copy and pasting all data from the three Excel .csv files into one Excel workbook with three spreadsheets. Finally, mark out all columns and in Excel Sort on Date so all numbers are presented from Oldest to Current as opposed to being the opposite with Yahoo's default.

Summary: By the end of step 1 you should create one combined Excel workbook with three spreadsheets in it respectively containing Monthly, Weekly and Daily price data and sorted from Oldest in row 2 to the Youngest the bottom row.

Step 2: Computing volatilities (Both regular Standard Deviation Volatility and Risk Metrics EWMA (Exponentially Weighted Moving Average) Volatility

For this step we will use another FTS Module referred to as the "Efficient Portfolio Module."
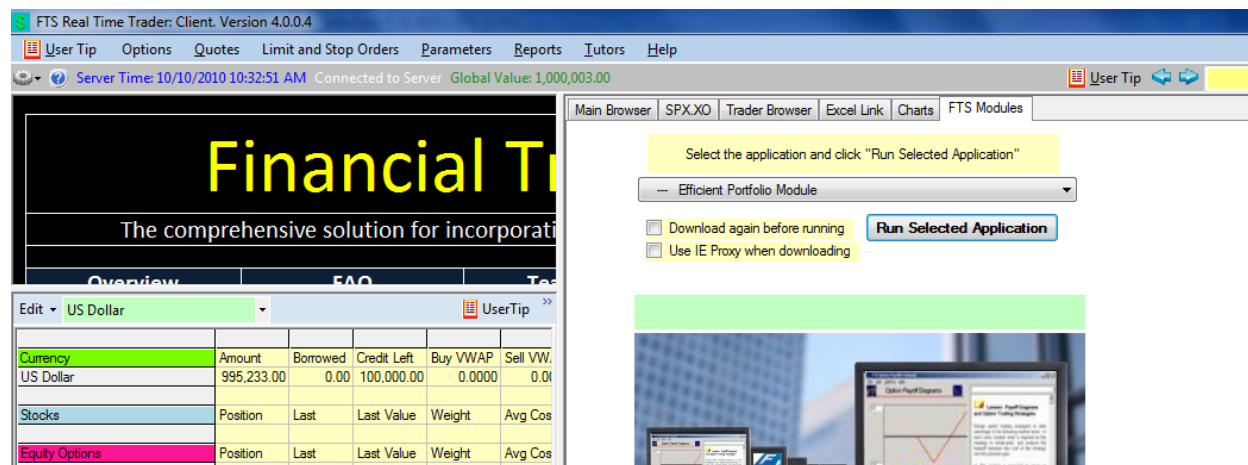
This module has a portfolio statistics component that provides you with flexibility for computing volatility. In particular it will compute regular standard deviations, moving average standard deviations and the Risk Metrics EWMA standard deviation (exponentially weighted moving average volatility).

Note: In statistics the term standard deviation is used in finance this is referred to as volatility and in this assignment we use the terms interchangeably.

Reading in the Excel Workbook

First, open the Excel workbook containing your data. In the following example we will refer to the monthly data. The data is in rows 2-62 and in particular we are interested in the Adjusted Prices in Column G. The software requires at least two data series so in the example to keep it happy indicate the First column is E through to G.

Select Price Data from the dropdown and Monthly for Data Frequency.

Click on Initialize and be sure to click above the names Adj Close etc., to set to Yes.

Finally click on OK to read in the data and the screen appears as follows:
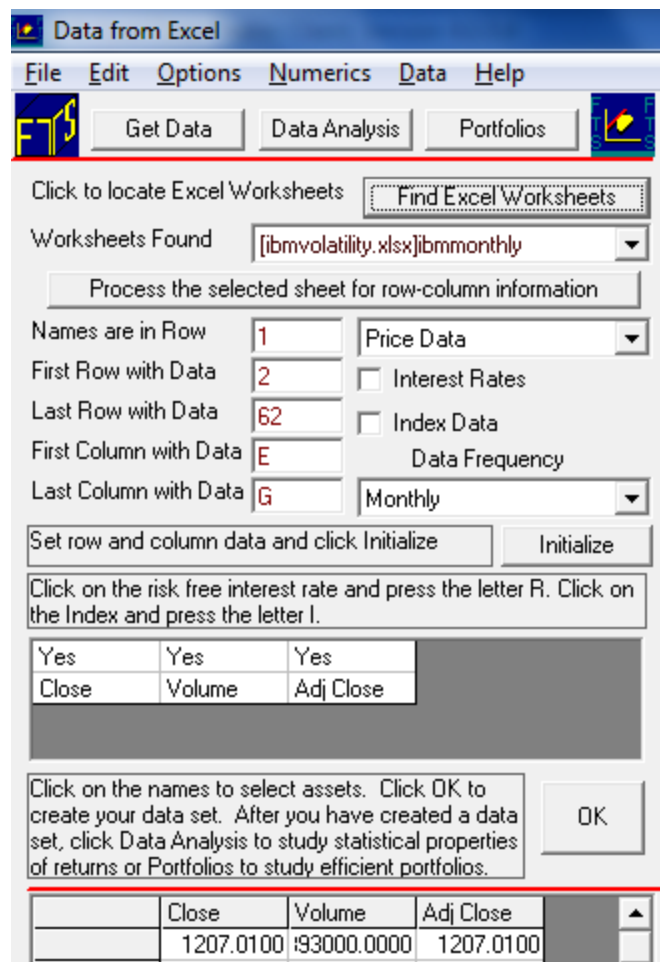
The next step is to Click on the button Data Analysis to get to the statistics screen:

Here under Adj Close type in 1 to select just this column of data and now you can click on Plot

Volatility
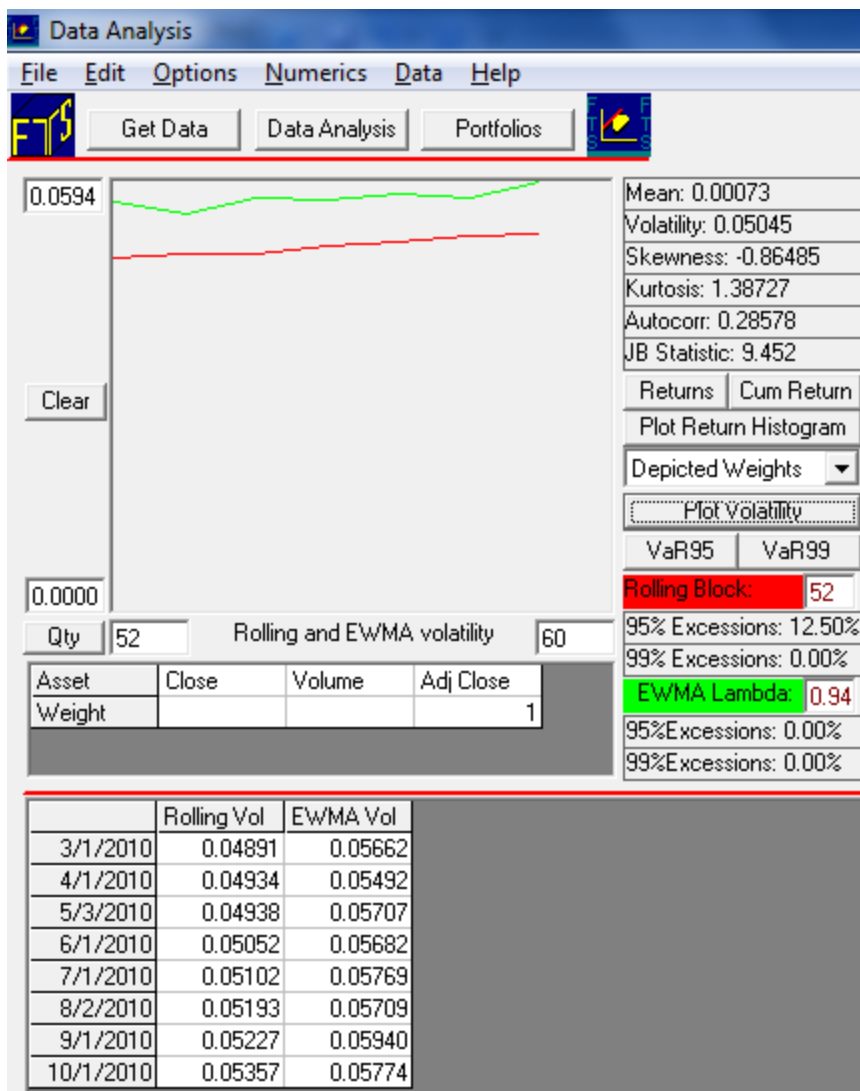
If the rolling block of data is 52 in the above example (i.e., use the most recent 52 observations) then the monthly volatility estimate is 0.05357 and the EWMA a little higher at 0.05774.

Converting Monthly Estimates to Annual Estimates

Annualize Daily Volatilities = Daily Standard Deviation of Returns * (Trading days^0.5) (e.g., 250 or 260 trading days approximately.

Annualized Weekly Volatility = Weekly Standard Deviation of Returns * 52^0.5

Annualized Monthly Volatility = Monthly Standard Deviation of Returns * 12^0.5

So this implies that annual volatility for EWMA is 0.05774*12^0.5 = 0.20 or 20%.

You should repeat the above for the other two spreadsheets to get volatility estimates from weekly and daily data. For example to link to the daily data the screen appears as follows:
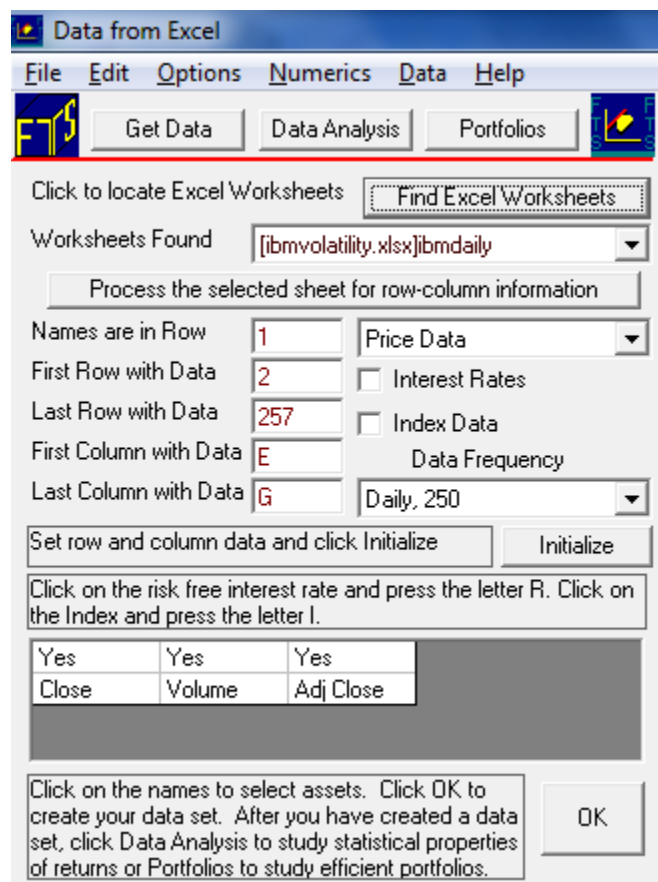
Finally by clicking on Data Analysis reveals the volatility behavior (in the example below the block sixe for moving averages was set to 100-days)::

This reveals the greater sensitivity of the EWMA volatility estimate to current volatility trends.

The annualized estimate is: 0.00962*(250^0.5) = 0.1521

Summary:

The objective of step 2 is to analyze the volatility behavior of the underlying index and form a volatility view over the time horizon covered by the various option contracts that you can trade using the FTS Real Time Client.

Step 3: Based upon your analysis of volatility form an (annualized) volatility view for the underlying index for the period covered by the life of the options. In this step you will enter your estimates into the FTS Real Time Client.

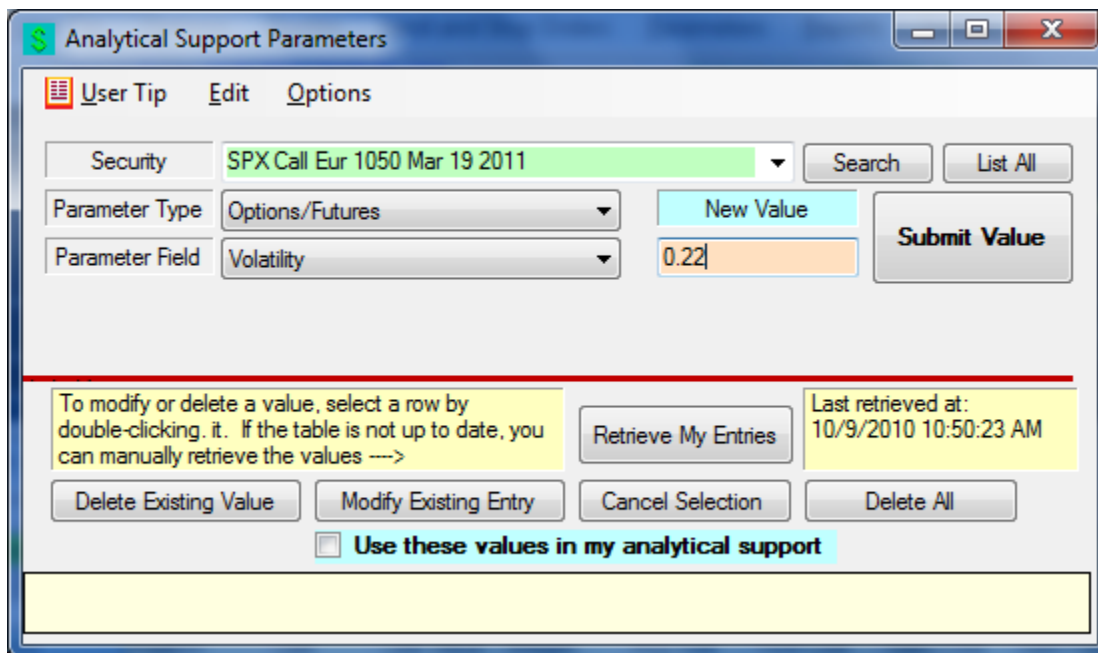**Working With the Interactive Support**

The FTS Real Time Client's support system provides another additional powerful level of support. The fields described

First select Parameters from the general menu item:
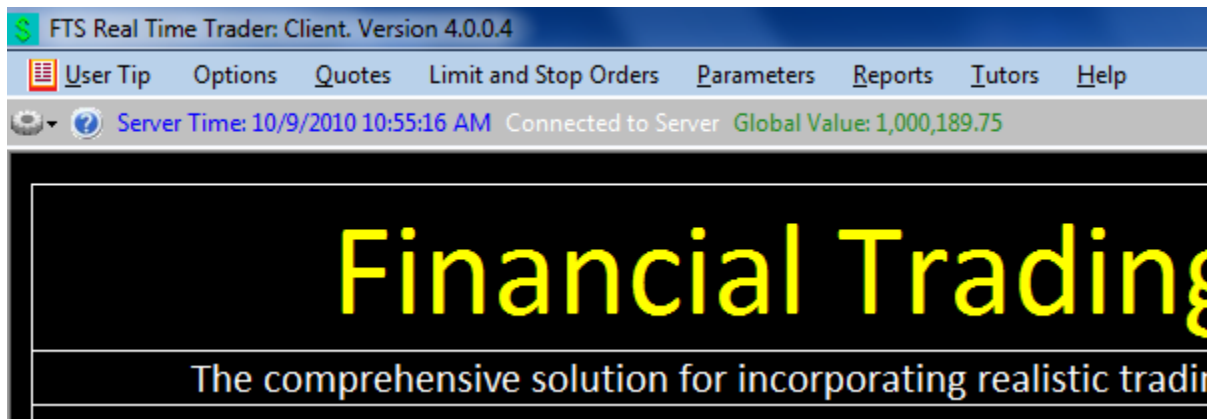
Second, select Parameters, List All and select the option contract:

For example, in the above suppose you want to change volatility to 0.22. In the above enter select the contract, enter volatility and click on submit Value. Observe there is a toggle switch beside the check box above: Use these values in my analytical support.

This controls Volatility in two of the option support systems:

Alternatively you can select Equity Options: Portfolio Analytics (User):

This gives more extensive user values – such as user implied greeks etc.,.

For example, observe how User Delta relative to 0.22 for SPX Call Eur 1050 Mar is 0.7611 whereas in the implied support this is 0.7569. The difference between working with implied volatility from the current option price versus working with the user specified volatility of 0.22 in the current example.

Finally, changing parameters one at a time is very laborious so the FTS Real Time Client allows you to do this via Excel. First click on Excel Link in the screen below
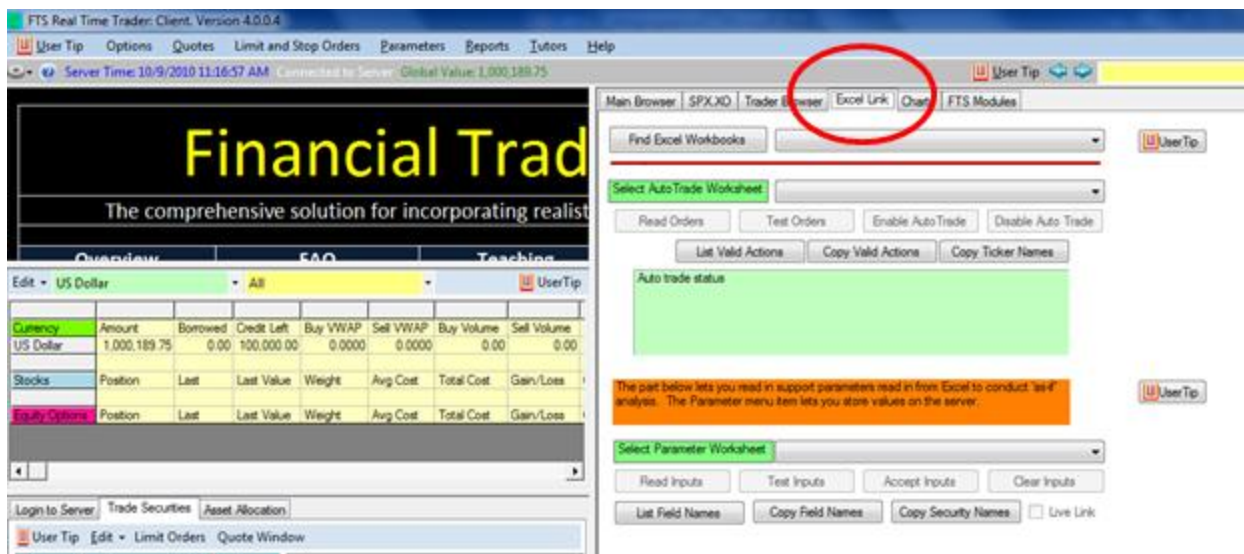
By clicking on (bottom) User Tips in the above screen provides the information on how to change many Parameter inputs at once by linking to Excel.

Project Requirements:

Select about 6 option contracts with different strike prices (out-of the money, at-the-money and in-the-money)/two maturities maturity to trade. You should trade both the puts and the calls for these contracts (12 options in total). Use the Parameter support to enter your volatility estimates and then record each day for about a week (or at least 5-daily observations) your predicted price and the actual price.

All projects should contain a cover sheet that list the full name of each team member.

Required questions:

(1) For the option contracts that you chose to trade describe how you estimated volatility for these contracts.

(2) For the six contract combinations and the five daily observations construct the mean difference between the option price (last traded) and your predicted price. Construct a table that has Maturity (2-levels), Strike Price (3-levels) and Option Type (Put versus Call). Enter the observed mean for each cell.

(3) Given your answer to 2) discuss your findings.

(4) If you were trying to buy undervalued and sell overvalued options is your assessment of volatility relevant for this? (why or why not).