The Options Portfolio Excel Spreadsheet

These notes provide a brief description of the Excel workbook *OptionsPivotTables.xls* and also identifies good online sources for those needing to learn some VBA.

1 The Mechanics of the Workbook

The workbook has four work-sheets and two *modules*. The four work-sheets are:

1. *OptionsData*: This sheet contains position data on $SX5E$, SPX and NKY option portfolios. In addition to various data columns describing quantities associated with each position, e.g. 'Underlying Price', 'Security Type', 'Maturity', 'Position' etc, there are several columns that provide the Greeks for each position. The VBA code that is used to calculate the options prices and their Greeks can be found in the VBA module *PricesGreeks*. This module may be viewed in the VBA editor which can be opened from the workbook by typing *Alt-F11*.

   The Greek columns should be self-explanatory but some additional comments are in order.

   \$Delta(ESP): this is the usual Black-Scholes delta multiplied by the price, S_t say, of the underlying security and it represents the **E**quivalent **S**tock **P**osition.

   \$Gamma: this is $S_t^2/2\times$ the regular Black-Scholes gamma.

   Example: Let $P(S)$ denote the price of some derivative security when the underlying security price is S. Then a simple second order Taylor expansion implies

   $$\begin{aligned} P(S + \Delta S) - P(S) &\approx (\Delta S)P'(S) + \frac{(\Delta S)^2}{2}P''(S) \\ &= \frac{\Delta S}{S} \text{ \$Delta} + \left(\frac{\Delta S}{S}\right)^2 \text{ \$Gamma} \\ &= \text{Return} \times \text{\$Delta} + \text{Return}^2 \times \text{\$Gamma} \end{aligned}$$

   which gives a simple approximation for the P&L due to a change in the underlying security.

   Vega 1%: This is $.01\times$ the Black-Scholes vega. It represents the change in the value of the option due to a 1 percentage point change in the implied volatility.

   Similar interpretations apply to 1 **Day Theta** and **Rho** (1%). The VBA code in the *PricesGreeks* module can be consulted for further details.

   Other columns contain the P&L resulting from stressing the underlying security price or the implied volatilities.

2. *PriceData*: This sheet contains the current implied volatility surface for each of the three underlying indices. The implied volatilities are found using a function *ComputeSVIImpliedVol* which may be found in the VBA module *ImpliedVols*. This function uses the *SVI* parameterization to calculate the implied volatilities. This sheet also contains dividend yields, exchange rates and risk-free interest rate curves.

3. *PivotTablesUnderlyingShift*: This worksheet contains *pivot tables* relating to the P&L from stressing the prices of the underlying securities. There are two pivot tables corresponding to the 'Total $Delta' and 'Total $Gamma' data columns. A third pivot table contains the P&L resulting from stressing the prices of the underlying securities. You should be able to check that the three tables are consistent with one another. In particular, for reasonable, i.e. not too large, stresses of the underlying security you should see that the P&L is consistent with that predicted by the delta and gamma pivot tables.

   Pivot tables provide a very convenient mechanism for viewing and summarizing data and it is certainly worthwhile learning how to use pivot tables in Excel. Some useful online sources are listed below.

4. *PivotTablesVolShift*: This worksheet contains pivot tables relating to the P&L from stressing the implied volatilities of the underlying securities. For reasonable, i.e. not too large, stresses of the implied volatilities you should see that the P&L is consistent with that predicted by the vega and volga pivot tables.

2 Online Sources for Learning How to Use Pivot Tables

There are many online tutorials for learning how to use pivot tables in Excel. Some of these can be found at:

1. < http://www.youtube.com/watch?v=l0a0dCgFA5g >

2. < http://www.dummies.com/how-to/content/the-essentials-of-excel-2010-pivot-tables-and-pivo.html >

3. < http://www.gcflearnfree.org/excel2010/20 >

3 Online Sources for Learning VBA

While the best way to learn any programming language is by diving in and writing code, there are several good online primers / tutorials that may be used for learning VBA. They can be found at:

1. < http://faculty.virginia.edu/ribando/modules/xls/VBAPrimer.pdf >

2. < http://www.anthony-vba.kefra.com/ >

Note that a particular easy way to get started is by using the Excel macro tool to generate VBA code. While the resulting code is often inefficient, it can be a useful to learn how to do write VBA code for more complicated objects such as charts or pivot tables.