**Forward Vol Calculation**

Bloomberg volatility surfaces only provides volatility for discrete points. For options that do not expire exactly at a specified tenor we need to interpolate the volatility.

**Bloomberg’s convention:**

Volatilities are given in the following format:

Surface Date: 8/1/16 6:00

|  |  |
| --- | --- |
| **Tenor** | **Vol 50D** |
| ON | 15 |
| 1W | 12 |
| 2W | 11 |
| 1M | 10 |

Note: In this example we only look at 50D but the method works for any delta in the same way.

The vol surface tell us the expected variance as a function of tenor. We use the tenor and surface recorded time to calculate the end time. We use Bloomberg’s market conventions to determine the cut time of each of the tenors. We then calculated the weighted number of days between the surface time and its respective cut time. The blue fields below are all derived from these conventions. Refer to their documentation for specifics. We also add in a reference point at the time of the surface that denotes zero variance.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Tenor** | **Days** | **Vol** | **Var** | **Cut Date** | **Weighted Days** |
| **Surf Time** | 0 | 0% | 0.0000 | 8/1/16 6:00 | 0.00 |
| **ON** | 1 | 15% | 0.0225 | 8/2/16 20:00 | 1.58 |
| **1W** | 7 | 12% | 0.1008 | 8/8/16 20:00 | 5.58 |
| **2W** | 14 | 11% | 0.1694 | 8/15/16 20:00 | 10.58 |
| **1M** | 30 | 10% | 0.3000 | 8/31/16 20:00 | 22.58 |

**Example 1: How to interpolate a vol that starts at the surface time and ends at time t.**

var1

varx

var2

w(t0,t0)=0

w(t0,t1)

w(t0,t2)

w(t0,tx)

**Example 2 How to interpolate a vol that starts *after* the surface time and ends at time t.**

The process is the same as the first example, except it is done twice. The first iteration calculates the amount of variance from the surface time to the start time of the relevant period. The second iteration calculated the amount of variance from the start time to the end of the relevant period. The difference of the two results in the variance of the relevant period.

varX

varz= vary - varX

vary

w(t0,t0)=0

w(t0,tx)

w(t0,ty)