Average daily trading volumes

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October 5, 2017

1 Rule of thumb for average daily volumes for gamma trading

Given a scenario where you are trading options when modelling and parameterisation are uncertain. Is there a rule thumb to say how much volume one should be trading to recover the extrinsic valuation?

Suppose the derivative contracts in question are vanilla enough to be approximated by Black-Scholes (or Black76 in the case of commodties). The average volume of gamma trades is given by

$$E(\text{tradingvolume})/(\text{optionvolume}) = \text{gamma} \times E(\text{dailymove}) \tag{1}$$

The expected daily move is represented by a one standard deviation move

$$E(\text{dailymove}) = F\sigma\delta t \tag{2}$$

where F is the price of the forward contract, σ is the volatility and δt is the length of a trading time step over which we assess the volume, typically one day. We will need the standard formulae for the Greeks in Black76 (ignoring interest rates for the sake of clarity):

$$\begin{aligned} \text{delta} &= \Delta = N(d_1) \\ \text{gamma} &= \Gamma = \frac{n(d_1)}{F\sigma\sqrt{\tau}} \\ d_1 &= \frac{\ln F/X + \sigma^2\tau/2}{\sigma\sqrt{\tau}} \end{aligned} \tag{3}$$

where τ is the maturity of the contract. Equations (1), (2) and (3) can be easily combined to give a formula that links the average daily gamma volumes per unit volume of the option to the square root of time to maturity measured in trading days and the delta of the option[1]

$$E(\text{tradingvolume})/(\text{optionvolume}) = \sqrt{\frac{\delta t}{\tau}} \times \frac{1}{\sqrt{2\pi}} \times \exp(-[N^{-1}(\Delta)]^2/2) \tag{4}$$

[1]This equation can simply be written in a cell of Excel as the formula $= \texttt{SQRT}([\texttt{DAYSTOMATURITY}]) * \texttt{SQRT}(1/(2 * \texttt{PI}())) * \texttt{EXP}(-0.5 * (\texttt{NORMSINV}([\texttt{DELTA}])^2)$

Some example values of the formula are shown in the table below for delta values from 10% to 90% and for trading days to expiry from 1, 7, 30, 90, 365, 730.

	1	7	30	90	365	730
10%	0.175	0.066	0.032	0.018	0.009	0.006
20%	0.280	0.106	0.051	0.030	0.015	0.010
30%	0.348	0.131	0.063	0.037	0.018	0.013
40%	0.386	0.146	0.071	0.041	0.020	0.014
50%	0.399	0.151	0.073	0.042	0.021	0.015
60%	0.386	0.146	0.071	0.041	0.020	0.014
70%	0.348	0.131	0.063	0.037	0.018	0.013
80%	0.280	0.106	0.051	0.030	0.015	0.010
90%	0.175	0.066	0.032	0.018	0.009	0.006