Blogs
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The Derivatives Exposure Equation

Our last post provided a big picture summary of the steps required to calculate a Fund's "derivatives exposure" for purposes of new Rule 18f-4. The post may have left an impression that this process should not be that difficult. To provide additional perspective, we offer the following equation for calculating derivatives exposure. If interest rate and currency hedges satisfy the following condition:

$$N_{HI} + \delta N_{OHI} + \delta N_{OHFX} + N_{HFX} \leq 1.1 \times (P_H + P_{MV} + P_{FX} + MV_{FX})$$

Then a Fund will be a limited derivatives user when:

$$.1 \times NA \geq MV_{SS} + (\delta N_O - \delta N_{OFF} - \delta N_{OHI} - \delta N_{OHFX}) + 10YN_I + (N_D - N_{OFF} - N_{HFX})$$

Where:

δN_{OFF} = Delta adjusted gross notional amount of options offsetting δN_O

N_I = Gross notional amount of interest rate derivatives transactions other than options

N_{IOFF} = Gross notional amount of interest rate derivative transactions other than options offsetting N_I

N_D = Gross notional amounts of all other derivatives transactions (i.e., derivatives transactions other than MV_{SS}, δN_O, δN_{OFF}, N_I, N_{IOFF}, N_{OFF}, N_{HI}, δN_{OHI}, δN_{OHFX}, and N_{HFX})

N_{OFF} = Gross notional amounts of derivatives transactions offsetting N_D

P_H = Principal amount of specific fixed-income investments and Fund borrowings subject to interest rate hedges

P_{MV} = Market value of specific equity investments subject to interest rate hedges

N_{HI} = Gross notional amount of interest rate derivatives other than options hedging P_H and P_{MV}

δN_{OHI} = Delta adjusted gross notional amount of interest rate options hedging P_H and P_{MV}

$10YN_I$ = 10-year bond equivalent of $N_I - N_{IOFF} - N_{HI}$

P_{FX} = Principal amount of specific fixed-income investments and Fund borrowings subject to currency hedges

MV_{FX} = Market value of specific equity investments subject to currency hedges

δN_{OHFX} = Delta adjusted gross notional amount of currency options hedging P_{FX} and MV_{FX}

N_{HFX} = Gross notional amounts of currency derivatives transactions hedging P_{FX} and MV_{FX}

This formula tries to resolve ambiguities to produce a smaller derivatives exposure. Admittedly, there is nothing hard about the math in this equation, although this would change if we included the formula for calculating an option's delta.

$$\delta = N(d1)$$

$$where: d1 = \frac{ln\left(\frac{S}{K}\right) + \left(r + \frac{\sigma^2}{2}\right)t}{\sigma\sqrt{t}}$$

Legend

K	Option strike price
N	Standard normal cumulative distribution function
r	Risk-free interest rate
σ	Volatility of the underlying
S	Price of the underlying
t	Time to option's expiry

For us, and we suspect many compliance officers, the most significant aspect of the equation is the sheer number of variables and the need to use different values (unadjusted and adjusted notional amounts, principal amounts, market values) for different variables. Creating a daily compliance report for derivatives exposure will require some careful data entry and programming.

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