

Constructing All-In Gamma Shocks

In the Commodity framework, risk factors for NG pipelines are currently defined with respect to base and spread (over NYM_NG). The delta sensitivities in RDR are given for the base and spread, but the gamma is an “all-in”, meaning it calculated with respect to base plus spread curve. Because we do not have separate risk factors for the all-in curves, we modify shocks generated for the base and spread curves to construct those for the all-in curves.

As mentioned in the previous section, we must use the shocks for the base curve (NYM_NG) and of the pipeline spreads to construct the shocks for the all-in curve (base plus pipeline spread).

The base shocks, with respect to the NYM_NG curve, are defined as relative, and so we write the day-over-day change for the market instruments as:

$$\frac{x_{t1} - x_{t0}}{x_{t0}} = A \quad (1)$$

The shocks to the pipeline spreads are absolute, and so we write the day-over-day changes as:

$$y_{t1} - y_{t0} = B \quad (2)$$

To find what the shock for the all-in curve would be, we define: $z_t = x_t + y_t$. An absolute shock to the all-in curve could then be written as:

$$z_{t1} - z_{t0} = (x_{t1} + y_{t1}) - (x_{t0} + y_{t0}) \quad (3)$$

$$z_{t1} - z_{t0} = Ax_{t0} + B \quad (4)$$

We can see that the shocks to the all-in curve require the relative and absolute changes of the base curve and spread respectively, as well as the closing rate of base curve.

In the framework, the shocks from the defined risk factors are mapped back to the market instruments. For instance, a typical deal might have the following delta and gamma and sensitivities:

	Delta		Gamma
AECOM: 201404	27,050	AECOM: 201404 AllIn	(286,160)
AECOM: 201405	26,679	AECOM: 201405 AllIn	(296,037)
AECOM: 201406	50,567	AECOM: 201406 AllIn	(407,071)
NG: 201404	355,749		
NG: 201405	270,704		
NG: 201406	235,752		

The all-in gamma sensitivities from RDR have a label which is distinctive and can also all easy mapping to the associated spread. The “NG” curve will always be the base curve.

The steps to generate the shocks for the all-in curve are as follows:

- 1 Generate scenarios for the market instruments corresponding to the base and spread curves

- 2 Given the base and spread scenarios, those for the all-in curve can be generated and should be mapped according to spread name and contract date. For instance, in the example above the AECOM: 201404 AllIn point would take absolute change from the AECOM: 201404 contract, and the base relative change and closing-rate from the NG: 201404

- 3 Using these scenarios, the absolute change for the all-in curve is constructed using equation (4)

The current list of spreads for which we might have all-in sensitivities are as follows: AECOM, ANRLA, ANROK, CG_ML, CHCG, CIG, CNGAP, COLAP, COLGU, ELPER, ELSAN, EPCON, FGZ3, HH, HSC, MALIN, MICHC, NAMEA, NGPLA, NGPMC, NGPST, NGPTO, NNDEM, NNVEN, NWROC, NWSUM, PAN, SOCAL, SONAT, TEELA, TENTX, TEZM3, TGAS1, TGASL, TL500, TL800, TRAN3, TRAN4, TRAN6, WAHA

Reference:

<https://finpricing.com/lib/IrCurve.html>