10.4.1 Un-Weighted/Uniformly-Weighted Scenario Analyses

Un-weighted, or more correctly, uniformly-weighted scenarios are created by shifting one or more of the input variables some number of "steps". Table 10.4 – 1 and Figures 10.4 – 1 a) and b) each illustrate a "7-point x 3-horizon" scenario report wrt underlying price a), and input volatility b) (i.e. standard deviation of returns).

Position P&L ▼ P&L on Gross ▼ basis

	Underlying1	Scenarios - Underlying1 Shift Size = 5.000						
Uniform ▼	Probs	0.05	0.1	0.15	0.4	0.15	0.1	0.050
	PUse(	1.000	1.000	1.000	1.000	1.000	1.000	1.000
	Shifts	-3	-2	-1	0	1	2	3
Manual ▼	Fwd*	85.00	90.00	95.00	100.00	105.00	110.00	115.00
0	0	-4.777	-12.248	-25.841	-47.506	-78.671	-120.009	-171.404
350	350	0.000	0.036	2.321	22.263	42.102	-5.959	-98.299
365	365	0.000	0.000	0.000	0.000	100.000	0.000	-100.000

Table 10.4 – 1. Position value for a 3-up and 3-down shift of a ratio call-spread wrt underlying price, for three different horizons (47 DTE, 7 DTE, and 1 DTE).

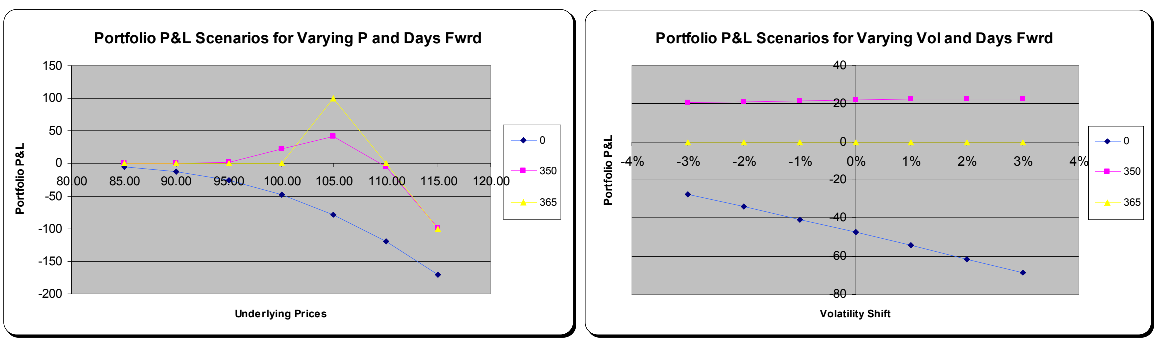

Figure 10.4 – 1. a) Position value for a 3-up and 3-down shift of a ratio call-spread wrt underlying price, for three different horizons (47 DTE, 7 DTE, and 1 DTE). b) A 3-up and 3-down shift of volatility for a ratio call-spread for three different horizons (47 DTE, 7 DTE, and 1 DTE).

The a) image is created by valuing the position at current conditions, plus three up and three down shifts of the underlying price (in this example in steps of 5 in the units of the underlying, e.g. "dollars") as can be seen along the x-axis. The entire seven point re-valuation is repeated for three different time horizons. In this example the horizons are 365 Days-To-Expiration[292] (DTE) (blue profile), 300 DTE (pink profile), and 0 DTE (yellow profile). Put differently, the results in image a) require the current position value plus 18 separate revaluations of the position (in this example a ratio call-spread) to create the additional points. The data-set for this chart is in the Table above it.

[292] Once again, in options pricing, there is a *"time"* that is time to expiration, and a measure of "*time*" that is "time evolution". Here, time to expiration is expressed as Days To Expiration (DTE's). As DTE increases, *t* decreases.

Immediately one may derive a useful observation that may not have been obvious without scenario analysis. For example, while the profiles close to expiration (yellow and pink) have the "expected" shape associated with a ratio call-spread, at longer horizons (yellow) the shape looks more like a short naked call, rather than a ratio call-spread. This allows traders to assess the "general rebalancing difficulty", which is much less (i.e. much easier) for this position a long way from expiration due to "smoothness" of the nearby (blue) profile compared to the "kinky" complex nature of the at expiration profile (yellow).

Figure 10.4 – 1 b) is a similar report, but now it is volatility that is up/down shifted three steps in each direction, and all of that repeated three times for each time horizon. For this example, all of the calculations are taken at the current underlying price and being held constant. As is discussed in Section 10.4.3, the calculations could be extended to have "true[293]" multi-dimensional scenarios where each up/down price shifted collection of scenarios is also up/down shifted for each of the volatility shifts. Thus, instead of 18+18+1 = 37calculations as required for these two charts, there would be (6*6*3)+1 = 109 position "revals".

Notice that the position value change for "price steps" are much greater (more severe) compared to the position value changes wrt volatility. Also, while the price shifted "horizons" converge to the contracted pay-out uniformly, the Vega results do not. That is, the manner in which exposure to volatility related movements develops as approaching expiration is fundamentally different compared that with varying underlying price.

Though much more could be said about these profiles, for now only one more point will be made. In particular, why would the slope of the P&L/Volatility profile change slope (e.g. from negative (yellow) to positive (pink))? This occurs since the position's moneyness changes in favour of moving ITM with the passage of time (due to positive drift). Thus, since the position is effectively "long vol" at the out set, but changes to "short vol" with the passage of time, the positions sensitivity to volatility reverses.

Of course, one could/would produce such "reports" for any and all input variables of interest, and generally produce at least some of those in a "true" multi-dimensional manner", as illustrated in Section 10.8.

Finally, these results are effectively P&L or cash based over an "entire range" of possible input values. This measure will exhibit different properties compared to pure sensitivity based results, even if those are expressed in cash terms, such as V01's. This is because a pure position scenario analysis depicts the "absolute" position value for each scenario. By contrast, sensitivity reports provide "relative" measures at each scenario point (e.g. the positions slope at any one point gives information about that point and its

[293] These images are not "true" multi-dimensional results since each one, although representing a different dimension (e.g. P, and σ) is varied while all other variable are held constant. That is, these results are like taking "slices" of the "true" multi-dimensional "surfaces", as seen in Section 10.4.3.