VolLevels Algo

For Vela's Metro trading platform
Version 1.06 (08-07-2019)

Testimonials

"During an active trading session, it is easy to lose track of critical IV and tick levels, IV term structure, and individual skews and curvature, while trying to monitor and trade simultaneously. Especially when volatility and skew are whipping around, it can become a guessing game, leaving me vulnerable to poorly timed or ill-advised trades.

The VolLevels algo neatly organizes the chaos, condensing the most important information in a way that allows me to easily spot and identify potential relative value trading opportunities in each vol curve as well as the overall IV term structure. The VolLevels algo enables me to capitalize on overbought and/or oversold conditions in both intraday/short-term markets, as well as relative value opportunities in 'big picture' scenarios. The algo helps prevent me from getting picked off by 'smart paper' on seemingly good trades everyone is doing that end up being losers. It's akin to a live 'cheat sheet' that enables me to quickly spot opportunity while simultaneously avoiding bad trades due to poor pricing by the marketplace."
-Beta tester & collaborator

IV Levels Tracking

When running, the algo monitors the published vol curves of all assigned options expirations. When a change in the published vol curve is detected (a new curve is published), the algo will update all monitored metrics for that expiration accordingly. For maximum utility, it is recommended that the VolLevels algo is run in conjunction with a realtime volatility curve fitter (such as our complimentary Dynamic Skew algo), however this is not a requirement. The algo can also monitor manual curve updates, and of any volatility curve type. The primary disadvantage of manual curve publications is the corresponding reduction in temporal resolution. For example, with relatively infrequent manual curve updates, the tracked intraday highs and lows of various vol-related metrics will be less accurate than the true extrema determined with frequent vol curve publications (the Dynamic Skew algo can publish new vol curves as often as once per second).

The algo allows net changes in IVs to be displayed with respect to two possible reference curves: EOD and Baseline. The user can toggle between these with a button click and can also arbitrarily assign (overwrite) either of these reference curves with another button click.

- **EOD** (End-Of-Day): Defaults to the last curve published prior to the server reboot. The vol curve stored at this slot can also be re-assigned at any time with a button click.
- **Baseline**: The vol curve stored at this slot is user-defined and can be re-assigned at any time with a button click.

The "From" and "From Vol" columns display the date/time of the reference curve currently being used to calculate net changes, and the prior vol from that reference curve, respectively. When a new reference curve is established, the "Net Change" and "Net Change Range" columns will update accordingly. The "Net Change Range" columns are reset at the start of each new trading day; that is, the highs and lows displayed are the intraday highs and lows.

The user can choose to view the "Net Change" and "Net Change Range" columns in two different modes:

- **IV Units**: This option displays the raw difference in IVs: $(IV_{current} - IV_{reference})$
- **Tick Units**: This option displays the raw difference in IVs transformed into approximate ATM tick units: $f(IV_{current} - IV_{reference})$. The function $f(x)$ is a robust and uniquely derived normalizing function that works accurately in all products and time-to-expiration horizons. It does _not_ suffer from any of the deficiencies that can occur when using simple vega ratios.

Users can toggle between the two display options with the click of a button and the relevant columns will update on the fly.

"Changes By Delta" Grid

The "Changes By Delta" grid allows the user to view IVs, net changes, and net change ranges (from either reference curve) on a delta axis (i.e., perspective). The 9 delta points used are symmetric and user-defined via the *"delta_points"* Configure screen setting. For example, if this setting is "35,25,15,5", then the 9 (out of the money) delta points displayed by the algo will be: { -5Δ, -15Δ, -25Δ, -35Δ, 50Δ, 35Δ, 25Δ, 15Δ, 5Δ }. The "Nearest Strike" column will also display the closest strike to each delta point.

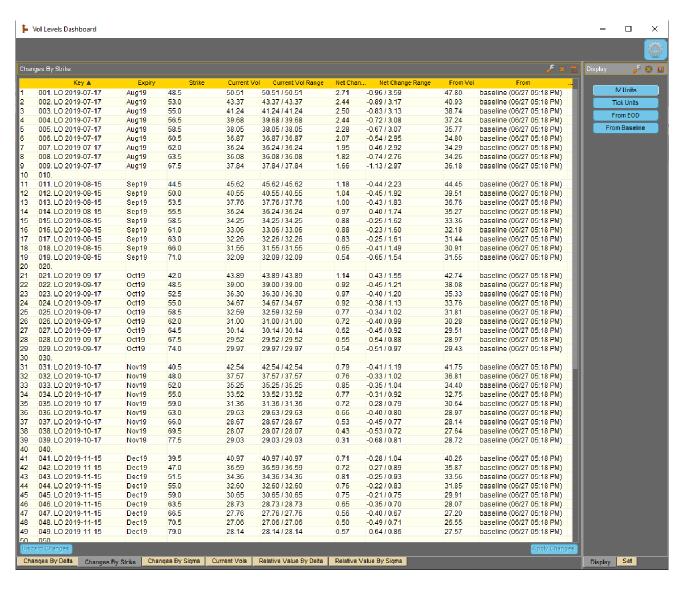|	Key ▲	Expiry	Delta	Nearest Strike	Current Vol	Current Vol Range	Net Change	Net Change Range	From Vol	From
1	001. LO 2019-07-17	Aug19	-5	48.5	50.37	50.37 / 50.37	5.18	-1.19 / 7.34	45.18	baseline (06/27 05:18 PM)
2	002. LO 2019-07-17	Aug19	-15	53.0	43.58	43.58 / 43.58	3.79	-1.00 / 5.32	39.79	baseline (06/27 05:18 PM)
3	003. LO 2019-07-17	Aug19	-25	55.0	41.33	41.33 / 41.33	3.61	-0.86 / 4.72	37.72	baseline (06/27 05:18 PM)
4	004. LO 2019-07-17	Aug19	-35	56.5	39.69	39.69 / 39.69	3.29	-0.71 / 4.37	36.40	baseline (06/27 05:18 PM)
5	005. LO 2019-07-17	Aug19	50	58.5	38.08	38.08 / 38.08	2.79	-0.66 / 3.79	35.29	baseline (06/27 05:18 PM)
6	006. LO 2019-07-17	Aug19	35	60.5	36.95	36.95 / 36.95	2.48	-0.55 / 3.48	34.47	baseline (06/27 05:18 PM)
7	007. LO 2019-07-17	Aug19	25	62.0	36.31	36.31 / 36.31	2.12	-0.47 / 3.18	34.19	baseline (06/27 05:18 PM)
8	008. LO 2019 07 17	Aug19	15	63.5	36.09	36.09 / 36.09	1.45	0.67 / 2.38	34.64	baseline (06/27 05:18 PM)
9	009. LO 2019-07-17	Aug19	5	67.5	37.71	37.71 / 37.71	0.57	-1.61 / 1.83	37.14	baseline (06/27 05:18 PM)
10	010.									
11	011. LO 2019-08-15	Sep19	-5	44.5	45.50	45.50 / 45.50	2.71	-0.63 / 4.16	42.79	baseline (06/27 05:18 PM)
12	012. LO 2019 08 15	Sep19	15	50.0	40.36	40.36 / 40.36	2.24	0.75 / 3.29	38.12	baseline (06/27 05:18 PM)
13	013. LO 2019-08-15	Sep19	-25	53.5	37.94	37.94 / 37.94	2.08	-0.53 / 2.97	35.85	baseline (06/27 05:18 PM)
14	014. LO 2019-08-15	Sep19	-35	55.5	36.20	36.20 / 36.20	1.90	-0.47 / 2.74	34.30	baseline (06/27 05:18 PM)
15	015. LO 2019-08-15	Sep19	50	58.5	34.32	34.32 / 34.32	1.59	-0.31 / 2.35	32.73	baseline (06/27 05:18 PM)
16	016. LO 2019 08 15	Sep19	35	61.0	33.00	33.00 / 33.00	1.38	0.23 / 2.11	31.62	baseline (06/27 05:18 PM)
17	017. LO 2019-08-15	Sep19	25	63.0	32.21	32.21 / 32.21	1.10	-0.25 / 1.87	31.11	baseline (06/27 05:18 PM)
18	018. LO 2019-08-15	Sep19	15	66.0	31.58	31.58 / 31.58	0.74	-0.43 / 1.57	30.84	baseline (06/27 05:18 PM)
19	019. LO 2019-08-15	Sep19	5	71.0	32.04	32.04 / 32.04	-0.13	-0.85 / 1.03	32.18	baseline (06/27 05:18 PM)
20	020.									
21	021. LO 2019-09-17	Oct19	-5	42.0	43.96	43.96 / 43.96	2.36	-0.67 / 2.08	41.60	baseline (06/27 05:18 PM)
22	022. LO 2019-09-17	Oct19	-15	48.5	38.95	38.95 / 38.95	1.96	-0.63 / 2.29	37.00	baseline (06/27 05:18 PM)
23	023. LO 2019-09-17	Oct19	-25	52.5	36.47	36.47 / 36.47	1.88	-0.58 / 2.14	34.59	baseline (06/27 05:18 PM)
24	024. LO 2019-09-17	Oct19	-35	55.0	34.64	34.64 / 34.64	1.71	-0.53 / 1.93	32.93	baseline (06/27 05:18 PM)
25	025. LO 2019-09-17	Oct19	50	50.5	32.60	32.60 / 32.60	1.39	-0.49 / 1.65	31.22	baseline (06/27 05:18 PM)
26	026. LO 2019-09-17	Oct19	35	62.0	31.06	31.06 / 31.06	1.17	-0.49 / 1.43	29.90	baseline (06/27 05:18 PM)
27	027. LO 2019-09-17	Oct19	25	64.5	30.19	30.19 / 30.19	0.93	-0.48 / 1.23	29.25	baseline (06/27 05:18 PM)
28	028. LO 2019-09-17	Oct19	15	67.5	29.52	29.52 / 29.52	0.64	-0.54 / 0.97	28.88	baseline (06/27 05:18 PM)
29	029. LO 2019-09-17	Oct19	5	74.0	29.92	29.92 / 29.92	0.14	-0.73 / 0.64	29.70	baseline (06/27 05:18 PM)
30	030.									
31	031. LO 2019-10-17	Nov19	-5	40.5	42.62	42.62 / 42.62	1.44	-0.57 / 2.15	41.18	baseline (06/27 05:18 PM)
32	032. LO 2019-10-17	Nov19	-15	48.0	37.69	37.69 / 37.69	1.36	-0.58 / 1.93	36.33	baseline (06/27 05:18 PM)
33	033. LO 2019-10-17	Nov19	-25	52.0	35.27	35.27 / 35.27	1.34	-0.55 / 1.82	33.93	baseline (06/27 05:18 PM)
34	034. LO 2019-10-17	Nov19	-35	55.0	33.42	33.42 / 33.42	1.25	-0.51 / 1.70	32.17	baseline (06/27 05:18 PM)
35	035. LO 2019-10-17	Nov19	50	59.0	31.33	31.33 / 31.33	1.07	-0.46 / 1.44	30.27	baseline (06/27 05:18 PM)
36	036. LO 2019-10-17	Nov19	35	63.0	29.65	29.65 / 29.65	0.86	-0.49 / 1.24	28.79	baseline (06/27 05:18 PM)
37	037. LO 2019-10-17	Nov19	25	66.0	28.72	28.72 / 28.72	0.66	-0.50 / 1.07	28.06	baseline (06/27 05:18 PM)
38	038. LO 2019-10-17	Nov19	15	69.5	28.07	28.07 / 28.07	0.46	-0.53 / 0.82	27.61	baseline (06/27 05:18 PM)
39	039. LO 2019-10-17	Nov19	5	77.5	28.99	28.99 / 28.99	0.07	-0.97 / 0.28	28.92	baseline (06/27 05:18 PM)
40	040.									
41	041. LO 2019-11-15	Dec19	-5	39.5	41.13	41.13 / 41.13	1.20	-0.39 / 1.95	39.93	baseline (06/27 05:18 PM)
42	042. LO 2019-11-15	Dec19	-15	47.0	36.57	36.57 / 36.57	1.13	-0.47 / 1.70	35.44	baseline (06/27 05:18 PM)
43	043. LO 2019-11-15	Dec19	-25	51.5	34.39	34.39 / 34.39	1.17	-0.47 / 1.67	33.22	baseline (06/27 05:18 PM)
44	044. LO 2019-11-15	Dec19	-35	55.0	32.65	32.65 / 32.65	1.10	-0.44 / 1.54	31.55	baseline (06/27 05:18 PM)
45	045. LO 2019-11-15	Dec19	50	59.0	30.61	30.61 / 30.61	1.01	-0.42 / 1.33	29.60	baseline (06/27 05:18 PM)
46	046. LO 2019-11-15	Dec19	35	63.5	28.81	28.81 / 28.81	0.84	-0.47 / 1.14	27.97	baseline (06/27 05:18 PM)
47	047. LO 2019-11-15	Dec19	25	66.5	27.80	27.80 / 27.80	0.68	-0.48 / 0.98	27.12	baseline (06/27 05:18 PM)
48	048. LO 2019-11-15	Dec19	15	70.5	27.00	27.00 / 27.00	0.54	-0.50 / 0.02	26.54	baseline (06/27 05:18 PM)
49	049. LO 2019-11-15	Dec19	5	79.0	28.14	28.14 / 28.14	0.39	-0.79 / 0.41	27.76	baseline (06/27 05:18 PM)
50	050.									

Changes By Delta | Changes By Strike | Changes By Sigma | Current Vols | Relative Value By Delta | Relative Value By Sigma

"Changes By Strike" Grid

The "Changes By Strike" grid allows the user to view IVs, net changes, and net change ranges (from either reference curve) on a strike axis (i.e., perspective). The 9 strikes used are those corresponding to the *current* nearest strikes of the user-defined delta points from the *"delta_points"* Configure screen setting. For example, for the center delta (50Δ) point, let's imagine strike 1330.0 is currently the nearest strike to 50Δ. Then the net change at this strike will be calculated as: (IV@$1330_{current}$ – IV@$1330_{reference}$), regardless of whether the historical delta at $1330_{reference}$ was 50 or not. In this sense, the "Changes By Delta" grid and the "Changes By Strike" grid offer complimentary "floating" and "sticky" perspectives into IV, respectively.
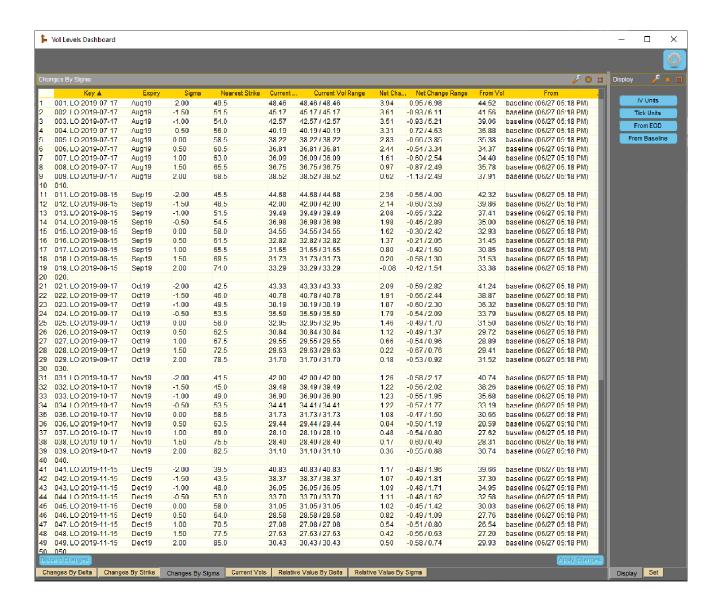
"Changes By Sigma" Grid

The "Changes By Sigma" grid allows the user to view IVs, net changes, and net change ranges (from either reference curve) on a sigma axis (i.e., perspective). The term "sigma" here is synonymous with "standard deviation." The Configure screen setting *"sigma_points_calc"* specifies whether a normal or lognormal calculation is used. The normal distribution is more applicable to Treasuries, rates, and currency products, whereas the lognormal distribution is more applicable to most other commodities that have an intrinsic physical value. The lognormal distribution creates a slight asymmetry where extreme downward moves are somewhat less likely than extreme upward moves; this can be understood as physical commodities having a non-zero intrinsic value which prevents prices from ever reaching values close to zero (but prices may be theoretically unbounded on the upside). The allowed values for the *"sigma_points_calc"* setting are:

- 0 = **Normal (standardized simple moneyness)**. The calculation of the sigma points uses the following formula: $((K/S) - 1) / (\sigma\sqrt{T})$
- 1 = **Lognormal (standardized log moneyness)**. The calculation of the sigma points uses the following formula: $\ln(K/S) / (\sigma\sqrt{T})$

The 9 sigma points used are symmetric and user-defined via the *"sigma_points"* Configure screen setting. For example, if this setting is "1.0,2.0,2.5,3.0", then the 9 sigma (or standard deviation) points displayed by the algo will be: { -3.0σ, -2.5σ, -2.0σ, -1.0σ, 0.0σ, 1.0σ, 2.0σ, 2.5σ, 3.0σ }. The "Nearest Strike" column will also display the closest strike to each sigma point.

Changes By Sigma

#	Key ▲	Expiry	Sigma	Nearest Strike	Current ...	Current Vol Range	Net Cha...	Net Change Range	From Vol	From
1	001. LO 2019-07-17	Aug19	2.00	49.5	48.46	48.46 / 48.46	3.94	0.95 / 6.98	44.52	baseline (06/27 05:18 PM)
2	002. LO 2019-07-17	Aug19	-1.50	51.5	45.17	45.17 / 45.17	3.61	-0.93 / 6.11	41.56	baseline (06/27 05:18 PM)
3	003. LO 2019-07-17	Aug19	-1.00	54.0	42.57	42.57 / 42.57	3.51	-0.93 / 5.21	39.06	baseline (06/27 05:18 PM)
4	004. LO 2019-07-17	Aug19	0.50	56.0	40.19	40.19 / 40.19	3.31	0.72 / 4.63	36.88	baseline (06/27 05:18 PM)
5	005. LO 2019-07-17	Aug19	0.00	58.5	38.22	38.22 / 38.22	2.83	-0.66 / 3.85	35.38	baseline (06/27 05:18 PM)
6	006. LO 2019-07-17	Aug19	0.50	60.5	36.81	36.81 / 36.81	2.44	-0.51 / 3.34	34.37	baseline (06/27 05:18 PM)
7	007. LO 2019-07-17	Aug19	1.00	63.0	36.09	36.09 / 36.09	1.61	-0.60 / 2.54	34.40	baseline (06/27 05:18 PM)
8	008. LO 2019-07-17	Aug19	1.50	65.5	36.75	36.75 / 36.75	0.97	-0.87 / 2.49	35.78	baseline (06/27 05:18 PM)
9	009. LO 2019-07-17	Aug19	2.00	68.5	38.52	38.52 / 38.52	0.62	-1.13 / 2.49	37.91	baseline (06/27 05:18 PM)
10	010.									
11	011. LO 2019-08-15	Sep19	-2.00	45.5	44.68	44.68 / 44.68	2.36	-0.58 / 4.00	42.32	baseline (06/27 05:18 PM)
12	012. LO 2019-08-15	Sep19	-1.50	48.5	42.00	42.00 / 42.00	2.14	-0.60 / 3.59	39.86	baseline (06/27 05:18 PM)
13	013. LO 2019-08-15	Sep19	-1.00	51.5	39.49	39.49 / 39.49	2.08	-0.65 / 3.22	37.41	baseline (06/27 05:18 PM)
14	014. LO 2019-08-15	Sep19	-0.50	54.5	36.98	36.98 / 36.98	1.98	-0.46 / 2.89	35.00	baseline (06/27 05:18 PM)
15	015. LO 2019-08-15	Sep19	0.00	58.0	34.55	34.55 / 34.55	1.62	-0.30 / 2.42	32.93	baseline (06/27 05:18 PM)
16	016. LO 2019-08-15	Sep19	0.50	61.5	32.82	32.82 / 32.82	1.37	-0.21 / 2.05	31.45	baseline (06/27 05:18 PM)
17	017. LO 2019-08-15	Sep19	1.00	65.5	31.65	31.65 / 31.65	0.80	-0.42 / 1.60	30.85	baseline (06/27 05:18 PM)
18	018. LO 2019-08-15	Sep19	1.50	69.5	31.73	31.73 / 31.73	0.20	-0.58 / 1.30	31.53	baseline (06/27 05:18 PM)
19	019. LO 2019-08-15	Sep19	2.00	74.0	33.29	33.29 / 33.29	-0.08	-0.42 / 1.54	33.38	baseline (06/27 05:18 PM)
20	020.									
21	021. LO 2019-09-17	Oct19	-2.00	42.5	43.33	43.33 / 43.33	2.09	-0.59 / 2.82	41.24	baseline (06/27 05:18 PM)
22	022. LO 2019-09-17	Oct19	-1.50	46.0	40.78	40.78 / 40.78	1.91	-0.66 / 2.44	38.87	baseline (06/27 05:18 PM)
23	023. LO 2019-09-17	Oct19	-1.00	49.5	38.19	38.19 / 38.19	1.87	-0.60 / 2.30	36.32	baseline (06/27 05:18 PM)
24	024. LO 2019-09-17	Oct19	-0.50	53.5	35.59	35.59 / 35.59	1.79	-0.54 / 2.09	33.79	baseline (06/27 05:18 PM)
25	025. LO 2019-09-17	Oct19	0.00	58.0	32.95	32.95 / 32.95	1.46	-0.49 / 1.70	31.50	baseline (06/27 05:18 PM)
26	026. LO 2019-09-17	Oct19	0.50	62.5	30.84	30.84 / 30.84	1.12	-0.49 / 1.37	29.72	baseline (06/27 05:18 PM)
27	027. LO 2019-09-17	Oct19	1.00	67.5	29.55	29.55 / 29.55	0.66	-0.54 / 0.96	28.89	baseline (06/27 05:18 PM)
28	028. LO 2019-09-17	Oct19	1.50	72.5	29.63	29.63 / 29.63	0.22	-0.67 / 0.76	29.41	baseline (06/27 05:18 PM)
29	029. LO 2019-09-17	Oct19	2.00	78.5	31.70	31.70 / 31.70	0.18	-0.53 / 0.92	31.52	baseline (06/27 05:18 PM)
30	030.									
31	031. LO 2019-10-17	Nov19	-2.00	41.5	42.00	42.00 / 42.00	1.26	-0.58 / 2.17	40.74	baseline (06/27 05:18 PM)
32	032. LO 2019-10-17	Nov19	-1.50	45.0	39.49	39.49 / 39.49	1.22	-0.56 / 2.02	38.26	baseline (06/27 05:18 PM)
33	033. LO 2019-10-17	Nov19	-1.00	49.0	36.90	36.90 / 36.90	1.23	-0.55 / 1.95	35.68	baseline (06/27 05:18 PM)
34	034. LO 2019-10-17	Nov19	-0.50	53.5	34.41	34.41 / 34.41	1.22	-0.57 / 1.77	33.19	baseline (06/27 05:18 PM)
35	035. LO 2019-10-17	Nov19	0.00	58.5	31.73	31.73 / 31.73	1.08	-0.47 / 1.50	30.65	baseline (06/27 05:18 PM)
36	036. LO 2019-10-17	Nov19	0.50	63.5	29.44	29.44 / 29.44	0.04	-0.50 / 1.19	29.59	baseline (06/27 05:18 PM)
37	037. LO 2019-10-17	Nov19	1.00	69.0	28.10	28.10 / 28.10	0.48	-0.54 / 0.80	27.62	baseline (06/27 05:18 PM)
38	038. LO 2019-10-17	Nov19	1.50	75.5	28.49	28.49 / 28.49	0.17	0.60 / 0.49	28.31	baseline (06/27 05:18 PM)
39	039. LO 2019-10-17	Nov19	2.00	82.5	31.10	31.10 / 31.10	0.36	-0.55 / 0.88	30.74	baseline (06/27 05:18 PM)
40	040.									
41	041. LO 2019-11-15	Dec19	-2.00	39.5	40.83	40.83 / 40.83	1.17	-0.48 / 1.96	39.66	baseline (06/27 05:18 PM)
42	042. LO 2019-11-15	Dec19	-1.50	43.5	38.37	38.37 / 38.37	1.07	-0.49 / 1.81	37.30	baseline (06/27 05:18 PM)
43	043. LO 2019-11-15	Dec19	-1.00	48.0	36.05	36.05 / 36.05	1.09	-0.48 / 1.71	34.95	baseline (06/27 05:18 PM)
44	044. LO 2019-11-15	Dec19	-0.50	53.0	33.70	33.70 / 33.70	1.11	-0.48 / 1.62	32.58	baseline (06/27 05:18 PM)
45	045. LO 2019-11-15	Dec19	0.00	58.0	31.05	31.05 / 31.05	1.02	-0.45 / 1.42	30.03	baseline (06/27 05:18 PM)
46	046. LO 2019-11-15	Dec19	0.50	64.0	28.58	28.58 / 28.58	0.82	-0.49 / 1.09	27.76	baseline (06/27 05:18 PM)
47	047. LO 2019-11-15	Dec19	1.00	70.5	27.08	27.08 / 27.08	0.54	-0.51 / 0.80	26.54	baseline (06/27 05:18 PM)
48	048. LO 2019-11-15	Dec19	1.50	77.5	27.63	27.63 / 27.63	0.42	-0.56 / 0.63	27.20	baseline (06/27 05:18 PM)
49	049. LO 2019-11-15	Dec19	2.00	85.0	30.43	30.43 / 30.43	0.50	-0.58 / 0.74	29.93	baseline (06/27 05:18 PM)
50	050.									

Display

IV Units | Tick Units | From EOD | From Baseline

Discard Changes · Apply Changes

Changes By Delta | Changes By Strike | Changes By Sigma | Current Vols | Relative Value By Delta | Relative Value By Sigma | Display | Set
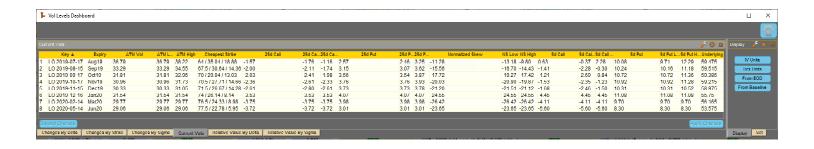
"Current Vols" Grid

The "Current Vols" grid displays the current vols on a delta basis, and some related metrics, for each monitored expiration. This grid does not display net changes and thus does not react to the assigned reference curve. Most of the columns are self-explanatory; more details are provided on some of the columns below:

- The "Cheapest Strike" column displays the strike with the lowest IV on the vol curve, followed by its current IV and delta.
- The "Normalized Skew" column displays a widely used calculation for a vol curve's skew: (25Δ Call IV – 25Δ Put IV) / 50Δ IV. Note that dividing by the 50Δ IV allows the user to measure all skews in the term structure on a standardized basis, independent of the level of volatility in any single expiration.
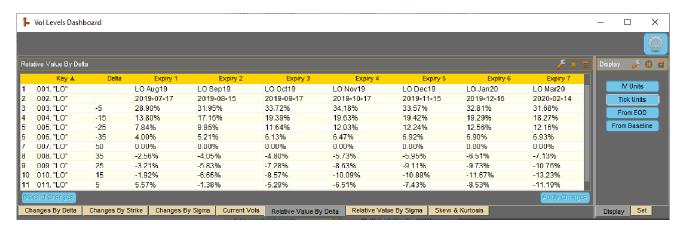
This grid is very similar to the dashboard found in the Dynamic Skew algo. One difference is that the IV differentials of the 25Δ and 5Δ points in this grid can also be displayed in ATM "Tick Units", which shows the current premium or discount in ATM equivalent ticks at the respective delta points.
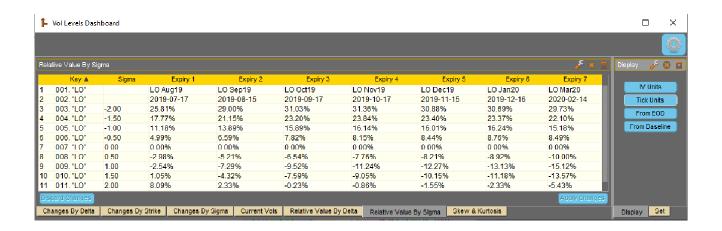

Relative Value Grids

The two relative value grids ("Relative Value By Delta" and "Relative Value By Sigma") display scaled IVs (IV ratios) across the term structure in standardized terms. Scaled IVs adjust for the often significant differences in the ATM IVs of each expiration and are expressed as a percentage (%) premium or discount to the 50Δ ("By Delta") or ATM ("By Sigma") point. This methodology is also effective when comparing skews between multiple, similar exchange-traded products. For example, at the time of writing, the ATM IV of the October 2019 expiration in WTI crude oil is 36.32%, whereas Brent crude oil at the same expiration has an ATM IV of 34.67%.

The expirations are listed in chronological order within these two grids. A maximum of 7 expirations will be displayed; these will be the nearest expirations in time. Note that monthly and weekly expirations will be grouped separately; this scheme prevents any monitored weekly options from taking too many expiration slots away from the monthly options. The same delta points and sigma points are used as in the "Changes By Delta" and "Changes By Sigma" grids.

	Key ▲	Sigma	Expiry 1	Expiry 2	Expiry 3	Expiry 4	Expiry 5	Expiry 6	Expiry 7
1	001. "LO"		LO Aug19	LO Sep19	LO Oct19	LO Nov19	LO Dec19	LO Jan20	LO Mar20
2	002. "LO"		2019-07-17	2019-08-15	2019-09-17	2019-10-17	2019-11-15	2019-12-16	2020-02-14
3	003. "LO"	-2.00	25.81%	29.00%	31.03%	31.36%	30.88%	30.69%	29.73%
4	004. "LO"	-1.50	17.77%	21.15%	23.20%	23.84%	23.40%	23.37%	22.10%
5	005. "LO"	-1.00	11.18%	13.89%	15.89%	16.14%	16.01%	16.24%	15.18%
6	006. "LO"	-0.50	4.99%	6.59%	7.82%	8.15%	8.44%	8.76%	8.49%
7	007. "LO"	0.00	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
8	008. "LO"	0.50	-2.98%	-5.21%	-6.54%	-7.76%	-8.21%	-8.92%	-10.00%
9	009. "LO"	1.00	-2.54%	-7.29%	-9.52%	-11.24%	-12.27%	-13.13%	-15.12%
10	010. "LO"	1.50	1.05%	-4.32%	-7.59%	-9.05%	-10.15%	-11.18%	-13.57%
11	011. "LO"	2.00	8.09%	2.33%	-0.23%	-0.86%	-1.55%	-2.33%	-5.43%

"Skew & Kurtosis" Grid

This grid displays other sophisticated, but widely used, metrics that quantify IV skew and kurtosis. These metrics help capture the dynamics and nuances of the IV surface.

- **SK10 Skew**: [(100% ATM Strike IV) - (90% Strike IV)] * √T
  - The square root of time factor normalizes same strike skews across a term structure.
  - Very applicable to equity option IV curves given their similar steep downside slopes.
- **Moneyness Skew**: (110% Strike IV) - (90% Strike IV)
  - Popular for fixed strike skews exhibited by stock and equity index IV curves.
  - Sensitive to IV at lower levels of IV, showing strong correlation to levels of volatility.
- **OTM Kurtosis**: (90% IV + 110% IV) / (2 * 100% ATM Strike IV)
  - This ratio compares strikes 10% OTM with the ATM strike.
- **25d Butterfly**: (25Δ Call IV + 25Δ Put IV) / (2 * 50Δ IV)
  - The inner curve butterfly ratio.
- **1 Sigma Butterfly**: (1.0σ Call IV + 1.0σ Put IV) / (2 * 0.0σ ATM Strike IV)
  - Butterfly ratio at the 1σ (i.e., 1 standard deviation) point away from ATM.
  - 1.0σ may approximate the area on the curve near ≈16Δ.
- **5d Wing Kurtosis**: (5Δ Call IV + 5Δ Put IV) / (2 * 50Δ IV)
  - Widely used data points to measure kurtosis of a vol curve.
  - Often close proximity to the ≈|2σ| points.

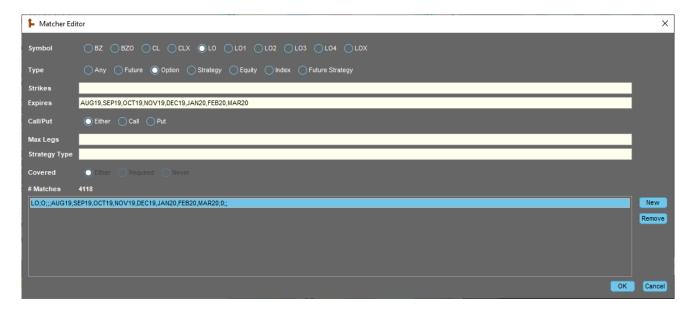# Vol Levels Dashboard

Skew & Kurtosis

Key ▲	Expiry	SK10 Ske...	SK10 Skew Range	Moneyne...	Moneyness Skew Range	OTM Kurt...	OTM Kurtosis Range	25d Butt...	25d Butterfly Range	1 Sigma B...	1 Sigma Butterfly Range	5d Wing ...	5d Wing Kurtosis...	From
1 001. "LO"	Sep19	-1.47	-1.51 / -1.38	-10.61	-11.24 / -9.79	1.150	1.133 / 1.155	1.025	1.019 / 1.028	1.033	1.025 / 1.035	1.164	1.148 / 1.172	baseline (08/07 08:17 PM)
2 002. "LO"	Oct19	1.36	1.40 / 1.33	6.60	6.75 / 6.41	1.024	1.022 / 1.027	1.018	1.015 / 1.021	1.026	1.024 / 1.029	1.122	1.121 / 1.128	baseline (08/07 08:17 PM)
3 003. "LO"	Nov19	-1.27	-1.28 / -1.19	-5.08	-5.13 / -4.87	1.011	1.009 / 1.012	1.013	1.012 / 1.015	1.023	1.019 / 1.023	1.103	1.100 / 1.104	baseline (08/07 08:17 PM)
4 004. "LO"	Dec19	-1.23	-1.26 / -1.17	-4.43	-4.52 / -4.24	1.005	1.003 / 1.007	1.011	1.009 / 1.012	1.017	1.015 / 1.018	1.096	1.091 / 1.096	baseline (08/07 08:17 PM)
5 005. "LO"	Jan20	-1.27	-1.30 / -1.21	-4.32	-4.33 / -4.13	0.999	0.990 / 1.001	1.008	1.004 / 1.009	1.008	1.004 / 1.009	1.079	1.072 / 1.080	baseline (08/07 08:17 PM)
6 006. "LO"	Feb20	1.27	1.31 / 1.23	4.02	4.13 / 3.96	0.997	0.995 / 0.997	0.999	0.998 / 1.002	0.993	0.992 / 0.995	1.054	1.051 / 1.057	baseline (08/07 08:17 PM)
7 007. "LO"	Mar20	-1.34	-1.41 / -1.25	-3.91	-4.14 / -3.76	0.997	0.995 / 0.997	0.998	0.995 / 1.003	0.990	0.987 / 0.991	1.046	1.041 / 1.052	baseline (08/07 08:17 PM)
8 008. "LO"	Jun20	-1.23	-1.28 / -1.21	-3.26	-3.32 / -3.22	0.992	0.992 / 0.994	0.987	0.987 / 0.989	0.972	0.972 / 0.974	1.031	1.031 / 1.035	baseline (08/07 08:17 PM)

Display buttons: IV Units, Tick Units, From EOD, From Baseline

Tabs: Changes By Delta | Changes By Strike | Changes By Sigma | Current Vols | Relative Value By Delta | Relative Value By Sigma | Skew & Kurtosis

Discard Changes / Apply Changes / Display / Set

Configuration Options

The example screenshot below shows the Configuration screen for a typical job instance. Note that only one VolLevels algo instance (a.k.a "job") is required to monitor any number of products and their expirations.

Configure - VolLevelsJob.1

System Defined

Name	Description	Value
dynamic	job supports dynamic configuration (read only)	☐
owner	job owner	
ownergroup	job group owner	
autostart	auto-start job when server starts	✔
autostop	auto-stop job if no active users	☐
group	job group identifier	
description	description of this job	Vol Levels
priority	job priority	normal
orderoptions	configure default order options	
limits	configure job limits	ordersPerSec=1;modifiesPerSec=1;openOrders=1;tradesPerSec=1;crossTicks=99999
testmode	in 'testmode' orders are not submitted	☐
debugmode	in 'debugmode' detailed log messages are sent to the client	☐
timer	how often (in ms) to generate timer events, or 0 to disable	5000
services	comma delimited list of services this job provides	
requires	comma delimited list of services this job requires	

Job Defined

Name	Description	Value
options	the options expirations to model	LO;O;;;SEP19,OCT19,NOV19,DEC19,JAN20,FEB20,MAR20,JUN20;0;;
verbosity	log detail level: 0=Minimal, 1=Basic, 2=Full, 3=Debug	1
delta_points	comma-separated list of 4 descending deltas	35,25,15,5
sigma_points	comma-separated list of 4 ascending standard deviations	1.0,2.0,2.5,3.0
sigma_points_calc	0=normal (standardized simple moneyness), 1=lognormal (standardized log moneyness)	1
vol_change_units	0=100*decimal vol, 1=equivalent ATM ticks	0
RESET	clear all saved info from the database	☐
REQTRD	require at least one futures or options trade before vol curve tracking begins	☐
REQOTRD	require at least one options trade before vol curve tracking begins	☐
debug_flags		

Job status is STARTED

Help | Permissions | Start | Stop | ☐ Simple Mode | OK | Apply | Cancel

"options"

Double-click the value cell to pop open the Matcher Editor dialog. Click the "New" button to unlock the filter fields. Select the radio button for the options symbol, set "Type" to "Option", and then type in the comma-separated expirations codes for each expiration to monitor for that options symbol in the "Expires" fields. For example, the Expires field of "SEP19,DEC19,MAR20" would include the September 2019, December 2019, and March 2020 options expirations for the selected options symbol. Success can be confirmed by viewing a positive number of matches (number of matching outright contracts) at the bottom field (see image below). All other fields can be left blank or at the default values. To include multiple options symbols for monitoring (for multiple products), just click the "New" button again and start adding the fields for the next options symbol.

"verbosity"

An integer value that controls the level of detail reported in the log.
- 0: Minimal
- 1: Basic
- 2: Full
- 3: Debug (only useful for debugging)

Recommended initial value is 1 (Basic).

"delta_points"

A list of 4 descending OTM deltas in the range of 1-49. The default setting is "35,25,15,5". These points specify the positive (call side) half of the symmetric array of OTM delta points, where the 50 delta point is the implicit center point and the negative copies of these points compose the negative (put side) half. These delta points control

the relevant columns and rows in various grids that show "by delta" perspectives, as well as the "Changes By Strike" grid that is also based on the nearest strikes to these delta points.

"sigma_points"

A list of 4 ascending standard deviations that are greater than 0.00. The default setting is "1.0,2.0,2.5,3.0". These points specify the positive (call side) half of the symmetric array of sigma points, where the 0.00 sigma point (ATM price) is the implicit center point and the negative copies of these points compose the negative (put side) half. These delta points control the relevant columns and rows in various grids that show "by sigma" perspectives.

"sigma_points_calc"

This integer setting controls whether the sigma points are calculated via normal standardized moneyness (setting of 0) or lognormal standardized moneyness (setting of 1). The normal calculation may be more applicable to Treasuries, rates, and currency products; the lognormal calculation may be more appropriate for many other commodities representing a physical resource with some inherent value. See the "`Changes By Sigma' Grid" section for more detail.

"vol_change_units"

This integer value controls the initial units used by the algo to display net changes and net change ranges. The user can always toggle to different display units on-the-fly by clicking either the "IV Units" or "Tick Units" buttons, while the algo is running.
- 0 = **IV Units**: This option displays the raw difference in IVs: ($IV_{current} - IV_{reference}$). The displayed values are formatted as 100.0 times the IV difference.
- 1= **Tick Units**: This option displays the raw difference in IVs transformed into approximate ATM tick units: $f(IV_{current} - IV_{reference})$. The function *f(x)* is a robust and uniquely derived normalizing function that works accurately in all products and time-to-expiration horizons. It does _not_ suffer from any of the deficiencies that can occur when using simple vega ratios.

"RESET"

This special flag tells the algo to reset any persisted information upon the next algo restart. While the range (high/low) information is automatically reset at the start of each new trading day, all tracked metrics, their ranges, and both reference curves are always stored in the database. This allows the algo to be restarted intraday with no loss of data. However, in certain rare cases, the user may wish to clear all saved data from the database and restart completely from scratch. One such case might be after an algo version update that is not backwards compatible.

"REQTRD"

This special flag requires the algo to observe at least one market trade in the options (or linked underlying future) before it begins tracking vol curves (i.e., looking for new vol

curve publications). This flag could be useful if the user wishes to edit or alter published vol curves from the Model Settings page prior to market open but, however, would prefer these custom fits not to be seen or tracked by the VolLevels algo.

"REQOTRD"

This special flag is nearly identical to the *"REQTRD"* flag. The only difference is that this flag explicitly requires an options trade to be observed before it publishes the very first vol curve (observed underlying trades do not count). This flag could be useful if the underlying market is open when the options market is still closed and the user wishes to ignore any potential curve publications prior to the options market opening.

"debug_flags"

This text field allows the user to assign various optional rare flags controlling algo behavior. These flags are intended for development and troubleshooting purposes only.