

US Rates Watch

Vol views – A negatively convex market

Volatility, liquidity and a negatively convex market

High uncertainty, low liquidity, high volatility and one-sided flows have pushed the market into a negatively convex dynamic whereby everything gets sold. Indeed, faced with a choice between de-risking/de-leveraging or hedging, portfolios are clearly skewed in the current context towards the former.

We do see a few reasons for why volatility may normalize from here, including: (1) more clear Fed guidance for the next 6m with higher credibility for the 3.4% median dot and only a couple of plausible paths towards it – likely 50/50/50/25 or 75/50/25/25; (2) a Fed that understands the recent high vol regime is counterproductive and that the stagflation view that seems to dominate sentiment is the scenario that contains the most significant tail risks (un-anchoring of inflation on the upside and growth on the downside), which likely drives a more fine-tuned communication after the recent reset of expectations; and (3) the fact that negatively convex market dynamics generally drive overshoots, which may imply some potential to fade the vol and rates overshoots near term. All of these in our view support some fading of vol over 3Q.

Of course the main driver for lower volatility in 2H is going to be expectations for lower inflation prints, which are still our base case (our economists expect 4.1% core PCE for end '22 and 3.1% for end-'23). Yet, it is likely that it will take longer than previously expected to get a real sense of the trajectory and price that back into the dynamic of duration and risky assets. The market is not going to be as quick to go back to 120bp for 1y1y vol as it was between early and late May (from c.155bp for 1y1y vol to 120bp, as inflation prints showed some signs of drifting lower and labor markets seemed to be moving past peak tightens).

From the mid-160bp levels for 1y1y1 vol currently (see Exhibit 7, highest levels since 4Q08) we may revert back to c.135-140bp, but beyond this range we likely need to see inflation prints realizing lower and a higher degree of conviction on the trajectory. On the right side of the grid, lognormal vols in the 35% context that continue to reflect a higher degree of uncertainty around the outlook imply a 105-115bp range for normal vols with SOFR forwards c.3-3.25%, only marginally lower from current levels. We see scope therefore for underperformance of the left side of the grid vs right side medium term (Exhibit 8 shows the degree of recent outperformance of the left side of the grid). The term structure of volatility continues to be inverted, and some fading of uncertainty and recent highs in vol is consistent with a -5bp to +5bp spread between 1m10y and 1y10y (-14bp currently– see Exhibit 9).

While, as we argue above, we think there is scope for vol to normalize over 3Q, investors should remain cautious. The range of uncertainty around both sides of the Fed mandate continues to be high, and that implies a wider range of potential outcomes for the Fed and for the market. The path lower, if it indeed realizes, will not be monotonic. Positioning-wise, we continue to like payer ladders at the frontend, vega steepeners, and payers at the frontend financed by selling payers in the belly.

21 June 2022

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ULC – Upper left corner

URC – Upper right corner

LLC – Lower left corner

LRC – Lower right corner

ITM – In the money

OTM – Out of the money

ATM – At the money

PCE: personal consumption expenditures

SOFR: Secured Overnight Financing Rate

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Timestamp: 21 June 2022 02:40PM EDT

Levels and Recent Moves

Exhibit 3: ATM Normal Volatility Grid

119bp for 1y10y volatility, above 100bp except on LRC

	1Y	2Y	3Y	5Y	7Y	10Y	30Y
1M	166.7	177.7	172.4	156.7	145.9	135.1	116.9
3M	167.5	171.8	166.6	150.8	140.4	130.0	112.4
6M	169.2	168.4	163.1	147.2	135.9	125.8	108.9
1Y	167.8	162.4	156.6	139.2	128.6	119.0	103.5
2Y	155.2	147.1	141.0	129.6	120.4	112.2	96.5
3Y	142.3	134.9	129.6	119.9	112.5	105.2	89.4
4Y	130.1	124.5	120.1	112.1	106.2	99.7	83.2
5Y	119.2	114.0	110.6	104.2	99.7	94.3	78.7
10Y	88.3	85.7	84.2	81.3	78.6	75.2	63.4
30Y	62.3	60.5	59.4	57.3	55.4	53.1	44.7

Source: BofA Global Research

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Exhibit 4: ATM Volatility Grid - 3m Z-Scores

Grid rich on 3m Z-Scores

	1Y	2Y	3Y	5Y	7Y	10Y	30Y
1M	2.4	2.6	2.5	2.0	1.9	1.7	1.3
3M	2.6	2.6	2.5	2.1	2.0	1.8	1.6
6M	2.6	2.8	2.7	2.3	2.1	2.0	1.7
1Y	2.3	2.5	2.4	2.0	1.9	1.7	1.6
2Y	2.0	1.9	1.9	1.8	1.7	1.6	1.5
3Y	1.9	1.8	1.7	1.6	1.6	1.5	1.4
4Y	1.7	1.7	1.6	1.6	1.5	1.4	1.1
5Y	1.6	1.5	1.5	1.3	1.3	1.2	0.9
10Y	1.2	0.9	0.9	0.8	0.7	0.6	0.6
30Y	0.5	0.2	0.2	0.1	0.1	0.0	0.0

Source: BofA Global Research

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Exhibit 5: ATM Normal Volatility Grid - CoW

Left side outperformed on the grid over the last week

	1Y	2Y	3Y	5Y	7Y	10Y	30Y
1M	40.1	33.3	31.1	24.5	21.3	18.1	12.8
3M	38.6	28.5	26.4	20.0	17.2	14.3	9.5
6M	30.8	22.6	21.4	17.6	13.7	11.1	6.7
1Y	23.1	19.5	18.1	13.8	11.0	8.5	5.2
2Y	16.2	14.7	13.8	12.0	9.9	8.1	5.9
3Y	15.2	12.7	11.7	9.8	8.4	6.9	5.1
4Y	11.4	10.3	9.5	7.9	6.9	5.8	3.6
5Y	8.4	7.5	6.8	5.5	5.1	4.6	2.9
10Y	3.5	3.4	3.3	3.2	3.1	3.0	1.8
30Y	1.6	1.6	1.5	1.5	1.4	1.4	0.6

Source: BofA Global Research

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Exhibit 6: ATM Straddle Premiums

7.9% straddle premiums for 1y10y

	1Y	2Y	3Y	5Y	7Y	10Y	30Y
1M	0.4%	0.8%	1.1%	1.6%	2.0%	2.5%	5.2%
3M	0.7%	1.3%	1.9%	2.8%	3.5%	4.4%	9.1%
6M	0.9%	1.8%	2.6%	3.8%	4.7%	6.0%	12.4%
1Y	1.3%	2.4%	3.4%	5.0%	6.3%	7.9%	16.4%
2Y	1.6%	3.0%	4.3%	6.3%	8.0%	10.2%	21.1%
3Y	1.8%	3.3%	4.6%	7.0%	8.9%	11.3%	23.4%
4Y	1.8%	3.4%	4.8%	7.3%	9.4%	12.1%	24.5%
5Y	1.8%	3.4%	4.8%	7.4%	9.6%	12.4%	25.4%
10Y	1.6%	3.1%	4.5%	7.0%	9.2%	12.1%	26.0%
30Y	1.2%	2.4%	3.5%	5.5%	7.3%	9.9%	21.6%

Source: BofA Global Research

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Exhibit 5: 1y10y normal vol

Vol > 75-85bp top end of the expected range in '22



Source: BofA Global Research; Bloomberg

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Exhibit 6: 3m10y vs. 3m2y Normal Volatility

Left side vol continues to outperform the right side



Source: BofA Global Research; Bloomberg

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Exhibit 7: 1y10y vs. 1m10y Normal Volatility

Back to extreme inversions of term structure of volatility

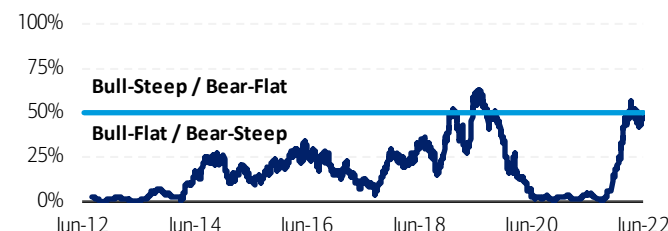


Source: BofA Global Research; Bloomberg

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Exhibit 8: 2s10s curve directionality 53% dictated by frontend

Un-anchoring of frontend since Oct-'21



Source: BofA Global Research

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Volatility Grid Relative Value

PCA Z-SCORES

Exhibit 11: 3m Z-Scores w/ PCA framework

Grid only rich in gamma on 3m Z-Scores

	1y	2y	3y	5y	7y	10y	30y
3m	0.5	0.5	0.1	-1.6	-0.8	-0.1	0.7
6m	0.2	1.3	1.1	-0.2	0.2	1.2	1.1
1y	-0.6	0.4	0.1	-0.9	-0.3	1.0	1.0
2y	-1.3	-1.1	-1.1	-0.6	0.4	0.7	0.5
5y	0.1	0.2	0.1	-0.2	-0.2	-0.3	-0.8
10y	-0.6	-0.6	-0.6	-0.7	-0.7	-0.7	-0.7

Source: BofA Global Research

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Exhibit 13: 6m Z-Scores w/ PCA framework

Grid only rich in gamma on 6m Z-Scores

	1y	2y	3y	5y	7y	10y	30y
3m	-1.0	0.9	1.1	-0.4	-0.3	-0.7	0.7
6m	-1.3	1.0	1.9	2.0	1.4	1.3	1.2
1y	-0.9	0.3	0.6	0.8	0.7	0.5	1.0
2y	-0.3	-0.4	-0.8	-0.3	0.2	0.3	0.6
5y	-1.3	-1.4	-1.8	-2.2	-2.1	-1.6	-1.6
10y	-2.3	-2.4	-2.5	-2.5	-2.5	-2.1	-1.3

Source: BofA Global Research

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Exhibit 15: 1y Z-Scores w/ PCA framework

Richness in belly and right side gamma on 1y Z-Scores

	1y	2y	3y	5y	7y	10y	30y
3m	1.0	0.4	1.3	1.2	1.4	1.0	0.9
6m	-2.0	0.2	2.9	2.9	2.4	2.0	1.4
1y	-2.6	-1.0	0.3	0.7	1.1	0.9	1.0
2y	-1.4	-1.5	-1.3	-0.4	0.1	0.4	0.8
5y	-1.7	-1.8	-2.0	-2.4	-2.3	-1.7	-1.1
10y	-2.1	-2.2	-2.2	-2.0	-1.8	-1.5	-0.7

Source: BofA Global Research

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Exhibit 17: 3m Z-Scores w/ modified PCA framework ...

Granular approach shows richness virtually across the grid...

	1y	2y	3y	5y	7y	10y	30y
1m	1.0	1.9	1.4	1.1	0.6	1.0	1.1
3m	2.6	3.1	2.0	1.4	0.9	1.2	1.6
6m	2.1	2.5	2.3	1.6	2.4	1.4	0.6
1y	1.8	2.2	2.7	2.9	3.7	2.3	1.6
2y	1.9	2.0	2.1	2.2	2.7	2.9	2.5
3y	2.4	1.5	1.0	1.6	1.5	1.9	2.8
4y	0.9	1.4	0.2	0.9	0.8	0.9	1.0
5y	1.9	3.2	1.5	0.7	-0.2	0.1	0.8
10y	1.8	2.2	2.9	0.8	0.2	-0.7	-0.8
15y	1.0	1.4	1.7	2.4	2.5	1.0	0.1
30y	0.2	-0.1	0.6	0.7	1.6	1.7	-0.5

Source: BofA Global Research

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Exhibit 12: 3m Z-Scores w/ PCA framework w/o rates directionality

Grid rich when directionality take into account

	1y	2y	3y	5y	7y	10y	30y
3m	1.8	1.9	1.7	0.8	0.7	0.6	0.6
6m	1.9	2.1	2.0	1.2	1.0	1.0	0.9
1y	1.3	1.6	1.4	0.6	0.6	0.7	0.7
2y	0.6	0.6	0.5	0.5	0.6	0.6	0.5
5y	0.4	0.3	0.3	0.2	0.1	0.1	-0.2
10y	0.0	-0.2	-0.2	-0.2	-0.3	-0.3	-0.4

Source: BofA Global Research

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Exhibit 14: 6m Z-Scores w/ PCA framework w/o rates directionality

Grid richness in gamma when directionality take into account

	1y	2y	3y	5y	7y	10y	30y
3m	1.3	1.6	1.6	1.3	1.1	0.9	1.1
6m	1.4	1.7	1.8	1.6	1.2	1.0	1.4
1y	1.0	1.3	1.2	0.9	0.7	0.6	0.9
2y	0.6	0.4	0.3	0.4	0.5	0.5	0.7
5y	-0.3	-0.4	-0.5	-0.5	-0.4	-0.4	-0.5
10y	-0.7	-1.1	-1.1	-1.0	-1.0	-0.9	-0.6

Source: BofA Global Research

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Exhibit 16: 1y Z-Scores w/ PCA framework w/o rates directionality

Grid richness when directionality removed

	1y	2y	3y	5y	7y	10y	30y
3m	1.6	1.3	1.8	2.0	1.9	1.7	1.4
6m	1.4	1.7	2.4	2.6	2.3	2.1	1.8
1y	0.8	1.5	2.1	2.0	1.9	1.7	1.7
2y	1.1	1.3	1.5	1.6	1.6	1.6	1.5
5y	0.7	0.5	0.5	0.4	0.5	0.5	0.3
10y	0.2	-0.1	-0.1	-0.1	-0.1	-0.1	0.1

Source: BofA Global Research

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Exhibit 18: ... and w/o directionality with rates

... persisting as directionality with rates is removed

	1y	2y	3y	5y	7y	10y	30y
1m	1.3	1.7	1.6	1.3	1.0	2.1	1.3
3m	2.6	3.1	1.7	1.2	1.1	1.1	1.5
6m	2.1	2.5	2.3	1.3	2.3	1.5	0.8
1y	1.7	2.3	2.7	2.9	3.7	2.0	1.9
2y	1.9	1.9	2.2	2.3	2.6	2.8	2.2
3y	2.4	1.6	0.6	1.2	1.5	2.0	2.5
4y	1.3	0.9	0.4	0.8	0.9	1.5	1.2
5y	1.9	3.4	0.8	0.8	0.3	0.1	0.7
10y	1.9	2.2	2.8	0.8	0.2	-0.3	-0.7
15y	0.8	1.7	1.3	2.4	3.6	0.4	0.6
30y	-0.1	0.4	0.7	1.2	1.6	1.7	-1.2

Source: BofA Global Research

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Skew Relative Value

Exhibit 19: Skew 25% delta

Receiver skew RV cheap on the LLC

	1Y	2Y	3Y	5Y	7Y	10Y	30Y
1M	-7.7	-10.5	-8.5	-7.7	-6.5	-5.0	-2.4
3M	-5.7	-8.9	-7.1	-6.2	-4.9	-3.2	-0.7
6M	-5.8	-10.4	-8.0	-6.6	-4.9	-2.9	-0.1
1Y	-8.0	-11.9	-11.1	-8.7	-6.1	-3.2	-0.1
2Y	-8.0	-8.6	-8.0	-6.4	-4.8	-3.1	0.2
5Y	-8.3	-6.7	-6.6	-3.8	-2.8	-1.6	1.0
10Y	-3.3	-2.1	-1.2	0.0	0.2	0.5	1.7
30Y	-1.5	-0.6	0.0	0.9	1.2	1.4	3.8

Source: BofA Global Research

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Exhibit 20: Skew 75% delta

Payer skew RV shows richness on the left side and belly

	1Y	2Y	3Y	5Y	7Y	10Y	30Y
1M	5.3	7.9	6.7	6.4	5.5	4.4	2.2
3M	10.3	12.9	11.3	10.2	8.7	7.0	4.2
6M	13.5	16.8	14.7	12.7	10.8	8.7	5.4
1Y	16.3	18.8	17.9	15.1	12.6	9.7	6.0
2Y	15.5	15.5	14.7	13.0	11.4	9.6	5.7
5Y	15.1	13.8	13.6	11.1	10.2	8.9	5.3
10Y	12.0	10.9	10.1	8.8	8.4	7.8	4.9
30Y	11.2	10.2	9.6	8.4	7.9	7.4	4.6

Source: BofA Global Research

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Exhibit 21: Breakeven Widths for Costless Receiver Ladders

114bp breakeven width for 1y10y receiver ladders

	1Y	2Y	3Y	5Y	7Y	10Y	30Y
1M	44	46	45	41	38	36	32
3M	81	80	79	72	68	64	57
6M	113	108	107	97	92	87	77
1Y	156	144	139	126	119	114	104
2Y	203	190	183	170	160	152	138
5Y	239	232	225	220	213	205	181
10Y	261	259	259	256	249	240	211

Source: BofA Global Research

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Exhibit 22: Breakeven Widths for Costless Payer Ladders

140bp breakeven width for 1y10y payer ladders

	1Y	2Y	3Y	5Y	7Y	10Y	30Y
1M	51	56	54	49	45	41	35
3M	97	102	98	88	81	74	62
6M	142	149	142	125	114	103	86
1Y	206	207	199	175	158	140	118
2Y	271	260	249	226	206	189	154
5Y	348	328	320	291	275	256	201
10Y	373	355	342	322	309	294	234

Source: BofA Global Research

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Exhibit 23: 3m Z-Score Receiver Skew (w/o direction w/ fwds & ATM)

Richness in intermediates expiries on 10y tails

	1Y	2Y	3Y	5Y	7Y	10Y	30Y
1M	-1.7	-2.5	-2.2	-2.1	-1.7	-1.5	-1.6
3M	0.6	-0.2	0.2	0.8	1.0	1.3	1.3
6M	0.8	-0.9	-0.1	-0.1	1.4	1.1	-0.5
1Y	1.3	-1.1	-1.4	-1.3	0.0	1.5	0.0
2Y	1.2	0.6	-0.3	0.6	0.7	0.9	-0.2
5Y	0.5	1.7	0.2	0.7	0.5	0.1	-0.6
10Y	-0.4	0.2	0.4	-0.1	-0.2	-0.4	-0.9

Source: BofA Global Research

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Exhibit 24: 3m Z-Score Payer Skew (w/o direction w/ fwds & ATM)

Payer skew fair to cheap cross the grid

	1Y	2Y	3Y	5Y	7Y	10Y	30Y
1M	-0.1	-0.1	-0.6	-0.8	-0.8	-1.1	-1.4
3M	-0.3	0.7	0.0	-0.5	-0.8	-1.1	-0.5
6M	-1.1	1.1	0.5	-0.4	-0.9	-1.6	-0.1
1Y	-1.0	0.9	1.1	1.2	0.5	-0.9	0.6
2Y	-1.3	-0.6	0.2	-0.2	-0.7	-0.9	0.2
5Y	-3.4	-3.2	-1.0	-1.2	-0.9	-0.4	0.6
10Y	-1.9	-1.4	-1.3	-0.6	-0.3	0.1	0.8

Source: BofA Global Research

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Exhibit 25: Ratio of Payer/Receiver BE widths for Costless Ladders

Ratios of breakeven widths above 100% across the grid

	1Y	2Y	3Y	5Y	7Y	10Y	30Y
1M	116%	122%	118%	118%	117%	113%	108%
3M	120%	127%	124%	123%	120%	116%	108%
6M	125%	138%	132%	129%	123%	119%	112%
1Y	132%	144%	143%	139%	133%	123%	114%
2Y	133%	137%	136%	133%	129%	124%	111%
5Y	146%	141%	142%	132%	129%	125%	111%
10Y	143%	137%	132%	125%	124%	122%	111%

Source: BofA Global Research

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Exhibit 26: 3m Z-Score Ratio of Payer/Receiver Skew

Z-Scores show fair/rich payers vs receivers skew

	1Y	2Y	3Y	5Y	7Y	10Y	30Y
1M	1.4	2.5	2.0	1.7	1.5	0.9	1.3
3M	1.1	2.0	1.4	0.8	0.6	0.2	0.5
6M	1.1	2.7	1.8	1.0	0.4	0.0	1.3
1Y	1.2	2.9	2.9	2.3	1.5	-0.2	1.3
2Y	0.7	1.1	0.6	0.3	0.1	0.1	0.6
5Y	-1.0	-1.2	0.2	-0.3	0.1	0.6	0.9
10Y	-0.1	-0.1	-0.1	0.7	0.8	0.9	0.9

Source: BofA Global Research

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Conditional Curve Trades

Exhibit 27: Bull Flatteners (pickup to forwards for ATM)

Buy longer maturity receiver, sell shorter maturity receiver

ATM	2/5s	2/10s	2/30s	5/10s	5/30s	10/30s
3M	7.5	14.6	20.2	7.5	13.6	6.5
6M	10.6	20.6	28.2	10.8	18.8	8.9
1Y	15.9	29.4	39.0	14.4	24.9	11.2
1.5Y	17.5	32.9	44.6	16.5	29.2	13.8
2Y	17.5	33.7	47.8	17.5	32.5	16.1

Source: BofA Global Research

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Exhibit 29: Bull Steepener (pickup to forwards for ATM)

Sell longer maturity receiver, buy shorter maturity receiver

ATM	2/5s	2/10s	2/30s	5/10s	5/30s	10/30s
3M	-7.5	-14.6	-20.2	-7.5	-13.6	-6.5
6M	-10.6	-20.6	-28.2	-10.8	-18.8	-8.9
1Y	-15.9	-29.4	-39.0	-14.4	-24.9	-11.2
1.5Y	-17.5	-32.9	-44.6	-16.5	-29.2	-13.8
2Y	-17.5	-33.7	-47.8	-17.5	-32.5	-16.1

Source: BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 31: Bear Flatteners (pickup to forwards for ATM)

Sell longer maturity payer, buy shorter maturity payer

ATM	2/5s	2/10s	2/30s	5/10s	5/30s	10/30s
3M	-8.5	-15.7	-21.0	-8.3	-14.2	-6.7
6M	-12.2	-22.6	-29.4	-12.0	-19.8	-9.3
1Y	-19.2	-32.5	-40.9	-16.1	-26.3	-12.0
1.5Y	-21.0	-36.8	-47.0	-18.8	-31.0	-14.6
2Y	-20.6	-37.8	-50.1	-19.8	-34.3	-17.3

Source: BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 33: Bear Steepener (pickup to forwards for ATM)

Buy longer maturity payer, sell shorter maturity payer

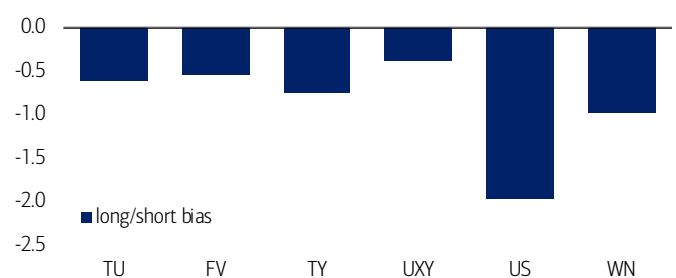
ATM	2/5s	2/10s	2/30s	5/10s	5/30s	10/30s
3M	8.5	15.7	21.0	8.3	14.2	6.7
6M	12.2	22.6	29.4	12.0	19.8	9.3
1Y	19.2	32.5	40.9	16.1	26.3	12.0
1.5Y	21.0	36.8	47.0	18.8	31.0	14.6
2Y	20.6	37.8	50.1	19.8	34.3	17.3

Source: BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 33: Analysis of proxies for futures positioning

Short bias across the curve but skewed towards the backend



Source: BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 28: Bull Flatteners (pickup to forwards for -25bp OTM)

Buy longer maturity receiver, sell shorter maturity receiver

-25bp	2/5s	2/10s	2/30s	5/10s	5/30s	10/30s
3M	9.3	17.9	24.9	9.3	16.9	8.3
6M	12.0	23.7	32.7	12.6	22.2	10.4
1Y	17.9	32.5	43.5	15.7	27.6	12.8
1.5Y	19.2	36.0	49.1	18.1	32.1	15.1
2Y	19.0	36.8	52.2	19.0	35.6	17.7

Source: BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 30: Bull Steepener (pickup to forwards for -25bp OTM)

Sell longer maturity receiver, buy shorter maturity receiver

-25bp	2/5s	2/10s	2/30s	5/10s	5/30s	10/30s
3M	-9.3	-17.9	-24.9	-9.3	-16.9	-8.3
6M	-12.0	-23.7	-32.7	-12.6	-22.2	-10.4
1Y	-17.9	-32.5	-43.5	-15.7	-27.6	-12.8
1.5Y	-19.2	-36.0	-49.1	-18.1	-32.1	-15.1
2Y	-19.0	-36.8	-52.2	-19.0	-35.6	-17.7

Source: BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 32: Bear Flatteners (pickup to forwards for +25bp OTM)

Sell longer maturity payer, buy shorter maturity payer

+25bp	2/5s	2/10s	2/30s	5/10s	5/30s	10/30s
3M	-11.4	-21.4	-28.6	-11.6	-20.0	-10.1
6M	-15.5	-28.8	-37.6	-15.7	-26.3	-12.8
1Y	-22.8	-39.2	-49.5	-20.2	-32.9	-15.5
1.5Y	-24.3	-43.1	-55.4	-22.6	-37.6	-18.3
2Y	-23.3	-43.5	-58.1	-23.1	-40.7	-21.0

Source: BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 34: Bear Steepener (pickup to forwards for +25bp OTM)

Buy longer maturity payer, sell shorter maturity payer

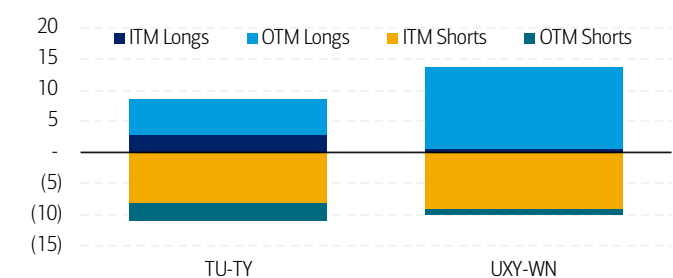
+25bp	2/5s	2/10s	2/30s	5/10s	5/30s	10/30s
3M	11.4	21.4	28.6	11.6	20.0	10.1
6M	15.5	28.8	37.6	15.7	26.3	12.8
1Y	22.8	39.2	49.5	20.2	32.9	15.5
1.5Y	24.3	43.1	55.4	22.6	37.6	18.3
2Y	23.3	43.5	58.1	23.1	40.7	21.0

Source: BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 34: Proxies for futures positioning across the curve

Backend OTM longs may expose curve to bear steepening



Source: BofA Global Research

BofA GLOBAL RESEARCH

Forward Volatility

Exhibit 37: 6m Forward Volatility

110.2bp for 6m fwd 1y10y

	1y	2y	5y	10y	30y
1m	155.1	151.1	133.1	113.4	99.8
3m	161.8	155.6	133.4	113.0	99.1
6m	163.0	155.7	132.1	111.5	97.5
1y	158.9	151.2	131.1	110.2	95.5
2y	146.1	138.5	122.0	103.8	88.2
5y	113.4	108.4	98.4	88.4	73.2
10y	82.7	80.4	77.1	71.3	60.1

Source: BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 38: 6m Fwd vol as % ATM

93% of ATM for 6m fwd 1y10y

	1y	2y	5y	10y	30y
1m	93%	85%	85%	84%	85%
3m	97%	91%	88%	87%	88%
6m	96%	92%	90%	89%	90%
1y	95%	93%	94%	93%	92%
2y	94%	94%	94%	93%	91%
5y	95%	95%	94%	94%	93%
10y	94%	94%	95%	95%	95%

Source: BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 39: 3m Z-Score of 6m Fwd vol % ATM

-1.0 Z-Score for 6m fwd 1y10y

	1y	2y	5y	10y	30y
1m	-2.6	-2.3	-2.0	-1.5	-0.9
3m	-2.1	-1.6	-1.9	-1.4	-0.7
6m	-2.0	-1.4	-2.2	-1.5	-0.7
1y	-1.1	-1.9	-1.4	-1.0	-0.3
2y	-2.1	-2.1	-1.8	-1.6	-1.2
5y	-0.9	-0.8	-1.1	-1.4	-1.5
10y	-1.5	-1.6	-1.7	-1.7	-1.4

Source: BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 40: 1y Forward Volatility

106.5bp for 1y fwd 1y10y

	1y	2y	5y	10y	30y
1m	157.2	153.4	135.7	112.6	97.0
3m	158.4	152.4	134.9	111.4	95.5
6m	157.5	149.4	133.1	110.0	93.8
1y	153.6	140.8	127.7	106.5	89.2
2y	135.7	131.3	117.1	98.6	81.8
5y	109.3	104.7	94.9	84.5	69.0
10y	79.7	77.4	74.5	68.5	57.5

Source: BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 41: 1y Fwd vol as % ATM

89% of ATM for 1y fwd 1y10y

	1y	2y	5y	10y	30y
1m	94%	86%	87%	83%	83%
3m	95%	89%	89%	86%	85%
6m	93%	89%	90%	87%	86%
1y	92%	87%	92%	89%	86%
2y	87%	89%	90%	88%	85%
5y	92%	92%	91%	90%	88%
10y	90%	90%	92%	91%	91%

Source: BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 42: 3m Z-Score of 1y Fwd vol % ATM

-0.8 Z-Score for 1y fwd 1y10y

	1y	2y	5y	10y	30y
1m	-1.9	-1.9	-1.1	-0.8	0.0
3m	-2.3	-2.0	-1.4	-1.2	-0.2
6m	-2.7	-2.1	-1.7	-1.4	-0.3
1y	-2.3	-2.3	-1.1	-0.8	-0.4
2y	-1.8	-1.7	-1.8	-1.5	-1.3
5y	-1.0	-1.0	-1.2	-1.5	-1.6
10y	-1.8	-1.8	-1.9	-1.9	-1.5

Source: BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 43: 2y Forward Volatility

93.3bp for 2y fwd 1y10y

	1y	2y	5y	10y	30y
1m	137.1	129.3	119.6	100.7	82.1
3m	139.8	128.1	117.0	97.9	79.6
6m	140.1	126.5	114.9	95.9	77.9
1y	137.5	124.3	112.3	93.3	75.0
2y	121.8	118.6	107.0	89.3	69.8
5y	101.5	97.9	89.3	78.6	62.8
10y	75.8	73.3	71.1	64.9	53.6

Source: BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 44: 2y Fwd vol as % ATM

78% of ATM for 2y fwd 1y10y

	1y	2y	5y	10y	30y
1m	82%	73%	76%	75%	70%
3m	83%	75%	78%	75%	71%
6m	83%	75%	78%	76%	72%
1y	82%	77%	81%	78%	72%
2y	78%	81%	83%	80%	72%
5y	85%	86%	86%	83%	80%
10y	86%	85%	88%	86%	85%

Source: BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 45: 3m Z-Score of 2y Fwd vol % ATM

-1.6 Z-Score for 2y fwd 1y10y

	1y	2y	5y	10y	30y
1m	-1.9	-2.4	-1.9	-1.4	-0.9
3m	-2.3	-2.4	-2.1	-1.8	-1.4
6m	-2.3	-2.5	-2.2	-1.9	-1.4
1y	-1.6	-2.3	-2.0	-1.6	-1.5
2y	-1.8	-1.7	-1.7	-1.5	-2.0
5y	-1.0	-1.1	-1.3	-1.7	-1.9
10y	-2.0	-2.0	-2.2	-2.3	-2.0

Source: BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 46: 3y Forward Volatility

89.6bp for 3y fwd 1y10y

	1y	2y	5y	10y	30y
1m	105.2	113.5	109.4	93.0	72.0
3m	110.1	115.5	108.9	92.0	69.4
6m	117.7	119.0	109.0	91.6	68.1
1y	130.4	121.1	106.9	89.6	66.3
2y	110.6	104.8	96.5	82.9	64.3
5y	94.3	91.4	84.9	74.8	58.8
10y	73.4	70.9	69.4	63.2	51.3

Source: BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 47: 3y Fwd vol as % ATM

75% of ATM for 3y fwd 1y10y

	1y	2y	5y	10y	30y
1m	63%	64%	70%	69%	62%
3m	66%	67%	72%	71%	62%
6m	70%	71%	74%	73%	63%
1y	78%	75%	77%	75%	64%
2y	71%	71%	74%	74%	67%
5y	79%	80%	81%	79%	75%
10y	83%	83%	85%	84%	81%

Source: BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 48: 3m Z-Score of 3y Fwd vol % ATM

-1.3 Z-Score for 3y fwd 1y10y

	1y	2y	5y	10y	30y
1m	-0.3	-1.0	-1.3	-1.2	-1.4
3m	-1.9	-1.9	-1.8	-1.6	-2.0
6m	-1.9	-1.9	-1.9	-1.5	-2.0
1y	-1.2	-1.6	-1.5	-1.3	-1.9
2y	-1.8	-1.6	-1.7	-1.6	-1.9
5y	-1.2	-1.3	-1.4	-1.9	-2.0
10y	-2.0	-2.1	-2.4	-2.5	-2.4

Source: BofA Global Research

BofA GLOBAL RESEARCH



Ratios implied/delivered

Exhibit 49: Implied vs. Delivered (21d) Ratio

Ratios of Implied to 21d delivered <100% virtually across the grid

	1y	2y	3y	5y	7y	10y	30y
1m	110%	112%	110%	103%	101%	99%	115%
3m	101%	103%	103%	97%	96%	95%	110%
6m	92%	96%	98%	94%	92%	92%	106%
1y	93%	95%	96%	91%	89%	89%	102%
2y	98%	96%	92%	90%	87%	88%	98%

Source: BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 50: Implied vs. Delivered (63d) Ratio

Ratios of Implied to 63d delivered <100% virtually across the grid

	1y	2y	3y	5y	7y	10y	30y
1m	122%	115%	110%	102%	100%	97%	98%
3m	109%	105%	102%	96%	94%	92%	94%
6m	98%	97%	97%	93%	90%	89%	91%
1y	92%	93%	94%	88%	86%	85%	86%
2y	92%	91%	88%	86%	83%	82%	81%

Source: BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 51: 3m Z-Scores for Implied vs. Delivered (21d) Ratio

Ratios of implied/21d delivered fair to rich across the grid

	1y	2y	3y	5y	7y	10y	30y
1m	0.1	0.6	0.9	0.7	0.6	0.5	1.2
3m	0.3	0.7	0.9	0.7	0.6	0.5	1.2
6m	0.4	0.8	0.9	0.8	0.6	0.5	1.3
1y	0.6	0.9	0.9	0.7	0.6	0.6	1.3
2y	1.0	0.9	0.8	0.7	0.6	0.7	1.4

Source: BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 52: 3m Z-Scores for Implied vs. Delivered (63d) Ratio

Ratios of implied/63d delivered fair to rich across the grid

	1y	2y	3y	5y	7y	10y	30y
1m	1.0	1.3	1.1	0.7	0.4	0.2	0.1
3m	1.2	1.1	1.0	0.6	0.4	0.1	0.1
6m	1.1	1.1	1.0	0.7	0.4	0.1	0.1
1y	0.7	0.7	0.7	0.4	0.2	0.0	0.1
2y	0.5	0.5	0.4	0.2	0.0	-0.1	0.1

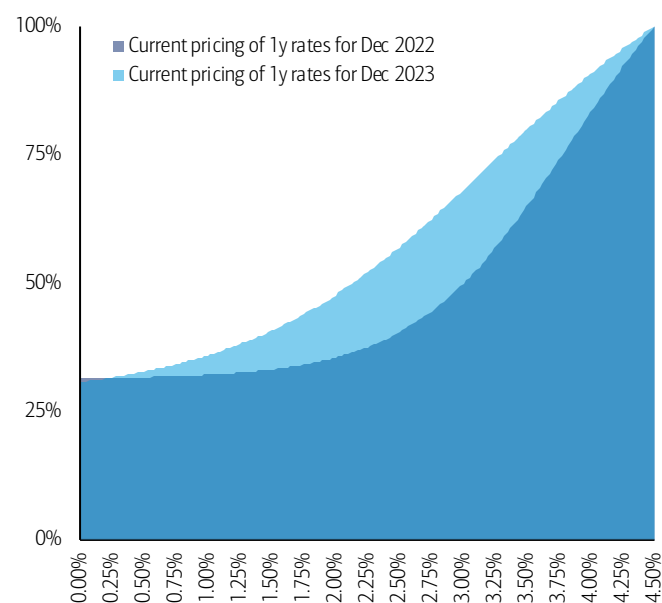
Source: BofA Global Research

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Rates probability distributions

Exhibit 51: CDF for 10y rates at end-2022 and end-2023

1y rate cumulative distribution functions (CDF)

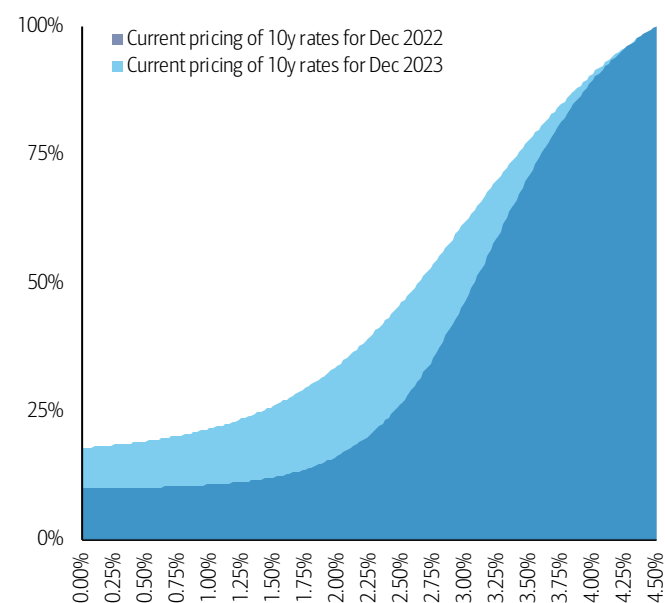


Source: BofA Global Research

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Exhibit 52: CDF for 10y rates at end-2022 and end-2023

10y rate cumulative distribution functions



Source: BofA Global Research

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Trade activity

Exhibit 55: Payer volumes over the last week (\$m notional)

Demand for payers over the last week

Payers	1y	2y	3Y	4Y	5Y	7Y	10Y	20Y	30Y	
<1m			43		150		44			237
1m		500			857	405	3789	200	85	5836
3m	2123	1020			1223		3301	176	946	8789
6m	1600	1467			1066		687			5120
1y	3657	1980	20	50	717		2914	359	2708	12405
2y	10000	380			6		1145		992	12523
3Y	300				12		566			878
4Y					411		10		102	523
5Y	37				200		747		75	1059
7Y					200		150		50	400
10Y							700	345		1045
20Y							120			120
30Y										
	17717	5347	63	50	4842	405	14173	1080	4958	48935

Source: BofA Global Research; SDR; Bloomberg

BofA GLOBAL RESEARCH

Exhibit 56: Receiver volumes over the last week (\$m notional)

Demand for payers over the last week

Receivers	1y	2y	3Y	4Y	5Y	7Y	10Y	20Y	30Y	
<1m	255	90	120	45	270		39			819
1m	1500	1015	220		700	125	996	170	46	4772
3m	3029	260			728		2355	122	350	6844
6m	5900				1300		665			7865
1y	2310	400	30		1176	10	2824	526	2885	10161
2y	1000	380					1334	15	340	3069
3Y	300						1266	46		1612
4Y								200		200
5Y					580		978	96	75	1729
7Y					200		150		50	400
10Y							650	150		800
20Y										
30Y										
	14294	2145	370	45	4954	135	11257	1325	3746	38271

Source: BofA Global Research; SDR; Bloomberg

BofA GLOBAL RESEARCH

Exhibit 57: Straddle volumes over the last week (\$m notional)

Demand for payers over the last week

Straddles	1y	2y	3Y	4Y	5Y	7Y	10Y	20Y	30Y	
<1m										
1m		250				100	652		25	1027
3m	250	230					1957	350	225	3012
6m	1750	750					850		75	3425
1y	4050	530		240	1150		3570		500	10040
2y	1000		240		120		1500	90	175	3125
3Y	1450	350			225		354	129	54	2562
4Y	340				68		400			808
5Y							558	240	394	1192
7Y								50	50	100
10Y							1518	390	25	1933
20Y							116			116
30Y							50			50
	8840	2110	240	240	1563	100	11525	1249	1523	27390

Source: BofA Global Research; SDR; Bloomberg

BofA GLOBAL RESEARCH



Formosa issuance

Exhibit 58: 2021 Formosa issuance (\$m)

37.7bn total issuance for the year, 32.1bn over same period as ytd

	2	5	7	10	15	20	25	30
1				958	30			220
2				284	45			
3					130			125
4					90			
5						50		19855
7								
10								920
15								
20								
25								
30								15000

Source: BofA Global Research, Bloomberg

BofA GLOBAL RESEARCH

Exhibit 59: 2022 Formosa issuance YTD (\$m)

12.1bn issuance YTD

	2	5	7	10	15	20	25	30
1			30	498	20			
2				360				
3				50	20			125
4				75	50			
5				20	45	125	80	10226
7								
10								315
15								
20								
25								
30								

Source: BofA Global Research, Bloomberg

BofA GLOBAL RESEARCH

Exhibit 60: Formosa issuance (\$m) since 2014

Peak issuance concentrated on the 5y30y tenor

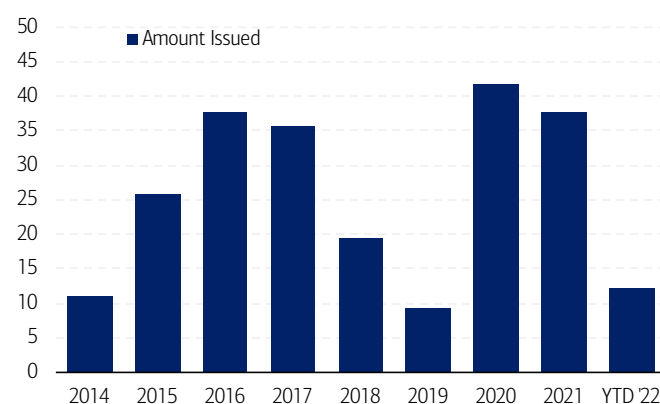
	2	5	7	10	15	20	25	30
1		205	30	1976	492	840		18274
2				798	45	1485		22177
3				50	150	240	225	15661
4				75	140	25	275	2441
5				20	445	1452	353	131513
7								5624
10								5336
15								
20								
25								
30								20500

Source: BofA Global Research, Bloomberg

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Exhibit 59: Total issuance per year since 2014 (\$bn)

12.1bn issuance YTD '22



Source: BofA Global Research, Bloomberg

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Notes

Exhibit 6: We classify the moves on the 2s10s or 5s30s curve every day in either one of these: bear flattening & bull steepening (where the 2y or 5y leg leads) or bear steepening & bull flattening (where the 10y or 30y leg leads). We sum each one of those columns over the last 2 or 3 months and divide by the absolute value of the curve moves to get a % index for each of the 4 different curve dynamics. We sum up the bear flattening + bull steepening indices into a new index - when this index = 0 the entire dynamic of the 2s10s or 5s30s curve is driven by the longer leg (10y or 30y leg respectively - corresponds to periods of forward guidance for example).

Exhibit 11/13/15: We calculate the principal components of the vol grid (the Eigen vectors of the covariance matrix) and take only the first 2/3 that represent around 90% of the variance in the data. We transpose the PCA transformation to recover vols from only these 2/3 components and obtain models for the vols. We calculate the residual of these models to the original series, and the Z-Score of these residuals.

Exhibit 12/14/16: Instead of taking the first 2/3 principal components of the vol grid and apply the transpose of the PCA transformation to them, we first regress each of these vol PCs on the principal components of rates, and apply the transpose of the vol PCA transformation to these models for the vol PCs. This way we remove the directionality between vol and rates from the vol dynamic, and obtain a purer Z-Score RV signal on vol.

Exhibit 21/22: In a payer/receiver ladder one buys the ATM strike and then you sell $ATM \pm x$ and $ATM \pm 2x$. In the terminal payoff diagram the position starts losing money when the forwards move past $ATM \pm 3x$, which we call the downside breakeven on the payer/receiver ladder.

We calculate the x (gap between strikes) daily such that the premium one has to pay for the payer/receiver ladder is zero (any vol structure that has unlimited downside can always be structured to be costless). These breakeven widths are therefore costless downside breakeven widths. When payer/receiver skew richens, this width increases - one needs to sell higher strikes $ATM \pm (x + \Delta)$ and $ATM \pm 2(x + \Delta)$ to pay for the ATM strike bought. By looking at how these costless downside breakeven widths change over time one can measure how payer/receiver skew has richen/cheapen over time.

Exhibit 23/24: Skew is directional with forwards and with the level of vol. We regress the costless downside breakeven widths (for receivers and payers) on the forwards and ATM vol, and look at the residuals of that regression to get a purer skew RV signal.



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