

US Rates Watch

Vol views – Still about uncertainty

Still about uncertainty

Our expectation for the volatility grid has been for a slow process of normalization as the market stress continues to fade and Fed policy shifts towards an on-hold stance (see [The dust settles on the volatility grid](#)). In Exhibit 1 we illustrate the scope for on-hold Fed policy to stay credible beyond May and for the rest of '23 by calculating the range of Taylor rule derived policy levels that are consistent with a range of expectations (from the Fed, the market consensus, and our economics team) for U3 and core PCE.

Significantly, we have described our view for the process of normalization of the volatility grid as being more about the second and third principal components of the grid rather than the first, i.e.: (1) left side to underperform vs the right side and converge to levels between -20 to -30bp for the 1y10y vs 1y1y vol spread (see Exhibit 2); and (2) gamma to cheapen vs. intermediates to normalize to levels between -5 and 5bp for the 1y10y vs 1m10v vol spread (see Exhibit 11).

Since early April we have indeed seen broadly lower gamma (see Exhibit 3) and 1m10y did reach flat levels vs 1y10y (see Exhibit 11), albeit with a slight pullback last week. However, while we expected the process of left side (1y1y) and gamma (1m10y) normalization vs. intermediates (1y10y) to be roughly synchronous, the left side has stayed quite supported (see Exhibit 3). We see two potential drivers for this decoupling between gamma and left side normalization:

- The market likely sees the potential for the Fed to stay credibly on hold over the next c.3m but likely not much beyond that. Exhibit 4 reflects the view of a challenging context for an on-hold Fed in '23, which continues to support intermediate vols in the belly and left side vs shorter expiries.
- The debt ceiling debate is gaining momentum and while that allows for some normalization of short gamma (1-3m expiries, likely rather frontloaded in this range), for expiries around the x-date (roughly 3-6m) the uncertainty caps the potential for vols to follow suit.

In general, steepening of the term structure of volatility reflects more benign market conditions. However, we don't think the recent cheapening of gamma vs. intermediates can be interpreted quite in that same way. Near term credibility around an on-hold Fed shift does help push short gamma lower, but uncertainty around the policy path and debt ceiling seems to have been dislocated out to 3-6m horizons helping the steepening dynamic for the "wrong" reasons. Our core view continues to be for normalization of the vol grid, but as we noted recently this is likely to be a slower process than we have seen at similar stages of the recent cycles (see [Rates roadmap for a Fed on hold](#)).

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Glossary

GFC – Great Financial crisis
ITM – In the money
LLC – Lower left corner
LRC – Lower right corner
OTM – Out of the money
ULC – Upper left corner
URC – Upper right corner

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Exhibit 1: Taylor rule policy levels contingent on U3 and Core PCE

Red = end '23 range of expectations; Green = end '24 range of expectations

		Unemployment (%)											
		1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6	
Core PCE	2.1	5.7	5.2	4.7	4.2	3.7	3.2	2.7	2.2	1.7	1.2	0.6	
	2.6	6.4	5.9	5.4	4.9	4.4	3.9	3.4	2.9	2.4	1.9	1.4	
	3.1	7.2	6.7	6.2	5.7	5.2	4.7	4.2	3.7	3.2	2.7	2.2	
	3.6	7.9	7.4	6.9	6.4	5.9	5.4	4.9	4.4	3.9	3.4	2.9	
	4.1	8.7	8.2	7.7	7.2	6.7	6.2	5.7	5.2	4.7	4.2	3.7	
	4.6	9.4	8.9	8.4	7.9	7.4	6.9	6.4	5.9	5.4	4.9	4.4	
	5.1	10.2	9.7	9.2	8.7	8.2	7.7	7.2	6.7	6.2	5.7	5.2	
	5.6	10.9	10.4	9.9	9.4	8.9	8.4	7.9	7.4	6.9	6.4	5.9	
	6.1	11.7	11.2	10.7	10.2	9.7	9.2	8.7	8.2	7.7	7.2	6.7	
	6.6	12.4	11.9	11.4	10.9	10.4	9.9	9.4	8.9	8.4	7.9	7.4	
	7.1	13.2	12.7	12.2	11.7	11.2	10.7	10.2	9.7	9.2	8.7	8.2	

Source: BofA Global Research

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Exhibit 2: 1y01y vs 1y1y vol spread

Left side richness persists (c.-60bp currently)



Source: BofA Global Research; Bloomberg

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Exhibit 3: Volatility grid moves since early April

Short gamma underperformed over April, while intermediates on the left side outperformed

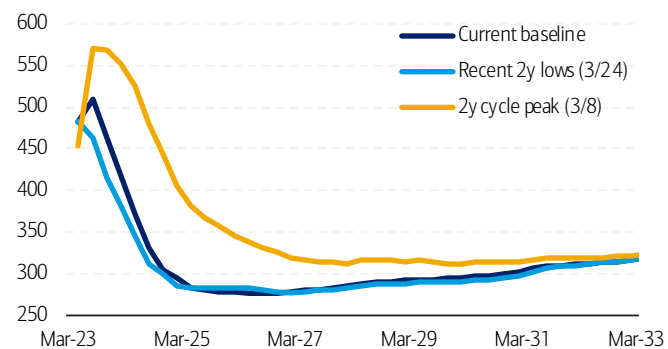
	1y	2y	3y	5y	7y	10y	30y
1m	-19	-12	-16	-9	-14	-15	-10
3m	0	3	0	-2	-6	-8	-6
6m	2	6	2	-2	0	0	-5
1y	11	10	7	0	-1	-1	-2
2y	6	4	3	1	-1	-1	-1
3y	5	2	2	2	1	-1	0
4y	5	4	3	2	1	0	0
5y	4	3	2	1	1	0	0
10y	3	2	2	1	1	0	0
15y	2	2	2	1	1	1	0
30y	2	2	2	1	1	1	1

Source: BofA Global Research

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Exhibit 4: Fed policy path currently priced in

Market challenging the view for a on-hold Fed



Source: BofA Global Research

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Levels and Recent Moves

Exhibit 5: ATM Normal Volatility Grid

108bp for 1y10y volatility

	1Y	2Y	3Y	5Y	7Y	10Y	30Y
1M	167.1	181.2	165.2	145.7	127.8	113.0	84.7
3M	173.5	175.7	166.7	144.1	127.7	113.9	87.7
6M	171.2	168.6	158.2	136.4	122.6	111.3	87.4
1Y	166.9	155.2	144.8	125.5	115.8	107.7	87.2
2Y	142.2	135.6	129.9	118.4	110.2	102.1	84.5
3Y	128.3	123.4	118.8	109.7	103.5	96.6	80.9
4Y	118.1	114.1	110.8	104.2	98.8	92.7	77.8
5Y	110.8	107.4	104.8	99.6	95.2	89.8	75.4
10Y	88.0	85.7	84.1	80.8	78.2	74.5	63.3
30Y	62.3	60.8	59.7	57.4	56.0	52.6	46.8

Source: BofA Global Research

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Exhibit 6: ATM Volatility Grid - 3m Z-Scores

Left side marginally rich & right side cheap on 3m Z-Scores

	1Y	2Y	3Y	5Y	7Y	10Y	30Y
1M	0.2	0.2	0.0	-0.2	-0.4	-0.7	-0.8
3M	0.4	0.4	0.4	0.2	-0.1	-0.5	-0.7
6M	0.4	0.5	0.5	0.2	0.0	-0.3	-0.8
1Y	0.7	0.7	0.5	0.1	0.0	-0.1	-0.4
2Y	0.5	0.4	0.4	0.3	0.1	-0.2	-0.3
3Y	0.4	0.3	0.2	0.0	0.0	-0.3	-0.2
4Y	0.2	0.2	0.2	0.1	0.0	-0.2	-0.1
5Y	0.3	0.3	0.2	0.2	0.1	-0.1	-0.1
10Y	0.5	0.4	0.3	0.2	0.1	-0.1	-0.3
30Y	1.0	1.0	1.0	0.7	0.9	0.2	0.6

Source: R BofA Global Research

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Exhibit 7: ATM Normal Volatility Grid - CoW

ULC outperformed on the grid over the last week

	1Y	2Y	3Y	5Y	7Y	10Y	30Y
1M	5.2	15.2	13.3	9.0	5.4	1.8	-1.4
3M	10.9	6.3	5.4	4.3	1.3	-1.6	-4.1
6M	8.5	4.0	2.5	1.0	-1.2	-3.4	-5.5
1Y	4.0	2.3	-0.9	-4.4	-3.9	-3.3	-3.8
2Y	1.8	-0.7	-1.1	-1.9	-2.2	-2.5	-2.1
3Y	0.4	-0.9	-1.5	-2.7	-2.5	-2.4	-1.2
4Y	-1.5	-1.5	-1.5	-1.6	-1.7	-1.8	-0.8
5Y	-2.4	-1.8	-1.6	-1.4	-1.4	-1.5	-0.6
10Y	-1.0	-0.8	-0.8	-0.7	-0.9	-1.0	-1.1
30Y	0.6	0.6	0.4	0.0	0.1	0.0	0.0

Source: BofA Global Research

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Exhibit 8: ATM Straddle Premiums (indicative only)

7.0% straddle premiums for 1y10y

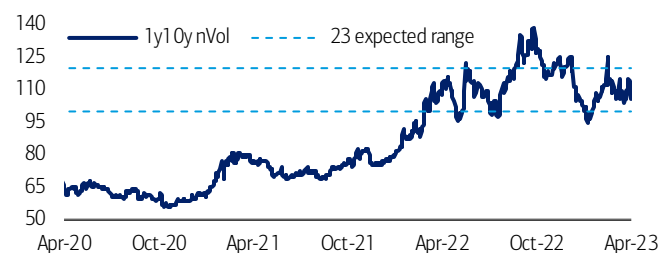
	1Y	2Y	3Y	5Y	7Y	10Y	30Y
1M	0.4%	0.8%	1.1%	1.5%	1.8%	2.2%	3.9%
3M	0.7%	1.3%	1.9%	2.6%	3.1%	3.8%	6.8%
6M	0.9%	1.8%	2.5%	3.5%	4.2%	5.3%	9.6%
1Y	1.2%	2.3%	3.2%	4.4%	5.5%	7.0%	13.3%
2Y	1.4%	2.7%	3.9%	5.7%	7.2%	9.1%	17.7%
3Y	1.6%	3.0%	4.2%	6.3%	8.1%	10.3%	20.2%
4Y	1.6%	3.1%	4.4%	6.7%	8.6%	11.0%	21.9%
5Y	1.6%	3.1%	4.5%	7.0%	9.0%	11.6%	23.1%
10Y	1.6%	3.0%	4.4%	6.8%	9.0%	11.7%	24.4%
30Y	1.1%	2.2%	3.2%	5.0%	6.7%	8.9%	22.1%

Source: BofA Global Research

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Exhibit 9: 1y10y vol dynamic since the COVID recession

Rich 1y10y vol vs. c.100-120bp expected range for 2023

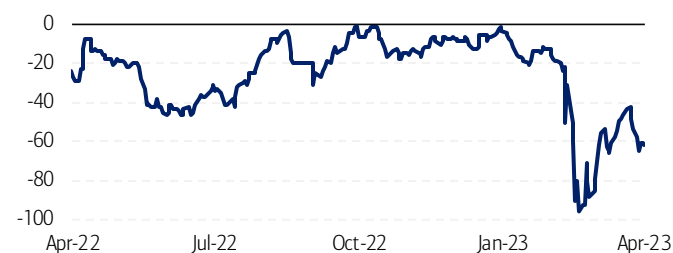


Source: BofA Global Research; Bloomberg

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Exhibit 10: 3m10y vs. 3m2y Normal Volatility

Left side lost some richness vs right side over the last week

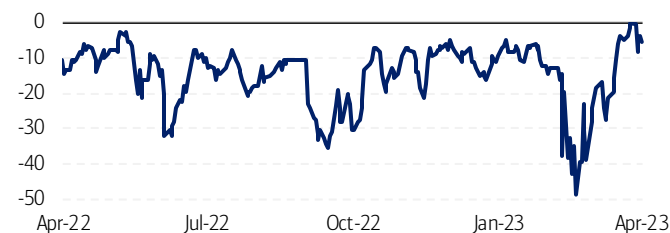


Source: BofA Global Research; Bloomberg

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Exhibit 11: 1y10y vs. 1m10y Normal Volatility

Vol inversion faded over the last week

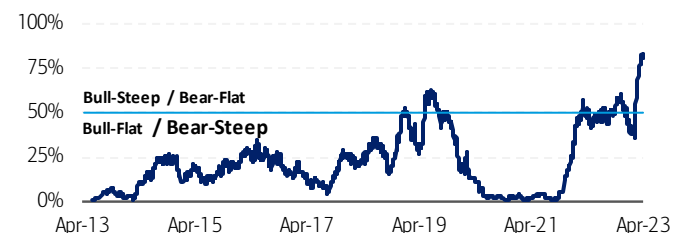


Source: BofA Global Research; Bloomberg

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Exhibit 12: 2s10s directionality 80% frontend driven over last 3m

...63% over the last 2wks. No signs of Fed on-hold frontend anchoring.



Source: BofA Global Research

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Volatility Grid Relative Value

PCA Z-SCORES

Exhibit 13: 3m Z-Scores w/ PCA framework

Left side richness on 3m Z-Scores, right side cheapness

	1y	2y	3y	5y	7y	10y	30y
3m	-1.7	-0.6	1.2	-0.8	-1.6	-2.3	-1.7
6m	-0.4	2.1	1.6	-0.4	-1.5	-3.4	-3.0
1y	-0.4	2.7	-1.4	-0.2	-0.3	-0.8	-2.2
2y	2.1	1.9	1.9	1.5	0.3	-1.2	-1.2
5y	1.1	1.0	0.8	0.5	-0.1	-0.9	-0.2
10y	1.8	1.6	1.4	0.8	0.4	-0.3	-0.6

Source: BofA Global Research

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Exhibit 15: 6m Z-Scores w/ PCA framework

Left side richness on 6m Z-Scores, right side cheapness

	1y	2y	3y	5y	7y	10y	30y
3m	-0.9	-1.1	-1.7	-1.1	-1.8	-2.4	-1.6
6m	-0.7	1.5	1.2	-0.3	-1.0	-2.2	-2.0
1y	2.3	2.2	1.6	0.1	0.0	-0.4	-0.9
2y	1.7	1.8	1.8	2.1	1.1	-0.6	-0.4
5y	1.3	1.4	1.2	0.9	0.5	-0.3	0.2
10y	1.6	1.4	1.3	0.8	0.5	0.0	-0.4

Source: BofA Global Research

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Exhibit 17: 1y Z-Scores w/ PCA framework

Left side richness on 1y Z-Scores, right side cheapness

	1y	2y	3y	5y	7y	10y	30y
3m	-0.4	-0.4	0.5	-0.6	-1.5	-2.3	-2.0
6m	-0.9	1.6	1.3	-0.3	-1.0	-1.8	-2.1
1y	-0.6	1.4	0.8	-0.3	0.2	0.5	-0.9
2y	0.3	0.9	1.2	2.0	1.8	0.7	0.0
5y	1.2	1.2	1.3	1.3	1.1	0.8	1.2
10y	2.2	2.1	2.0	1.6	1.5	1.2	0.9

Source: BofA Global Research

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Exhibit 19: 3m Z-Scores w/ modified PCA framework ...

Grid rich on the upper left and gamma

	1y	2y	3y	5y	7y	10y	30y
1m	-0.1	4.4	3.7	2.7	2.3	1.4	0.3
3m	3.7	3.1	2.5	2.4	1.8	0.1	1.8
6m	3.5	2.1	1.6	1.3	0.4	0.5	0.3
1y	2.5	1.3	2.7	0.0	-1.1	0.9	0.6
2y	1.4	0.3	0.6	0.6	-0.4	0.3	-0.1
3y	0.7	1.4	0.8	0.8	-0.2	0.3	-1.7
4y	-0.3	1.6	1.4	0.5	1.5	-0.4	-0.4
5y	-0.5	-2.0	0.6	0.8	1.0	-0.8	-0.9
10y	2.2	-1.1	-1.7	1.0	0.6	1.1	-0.2
15y	-0.1	-0.1	-1.0	2.0	-2.5	-0.2	1.4
30y	0.6	-0.4	0.6	0.5	-0.2	-1.6	0.2

Source: BofA Global Research

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Exhibit 14: 3m Z-Scores w/ PCA framework w/o rates directionality

Left side rich vs right side cheap when directionality considered

	1y	2y	3y	5y	7y	10y	30y
3m	0.0	0.0	0.2	-0.1	-0.3	-0.7	-0.8
6m	0.0	0.3	0.4	0.0	-0.2	-0.5	-0.9
1y	0.6	0.7	0.6	0.1	0.0	-0.1	-0.3
2y	0.5	0.5	0.5	0.5	0.3	-0.2	-0.1
5y	0.4	0.4	0.4	0.3	0.1	-0.1	0.1
10y	0.9	0.8	0.7	0.5	0.3	0.0	-0.2

Source: BofA Global Research

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Exhibit 16: 6m Z-Scores w/ PCA framework w/o rates directionality

Left side rich vs right side cheap when directionality considered

	1y	2y	3y	5y	7y	10y	30y
3m	0.4	0.4	0.5	0.0	-0.4	-0.9	-1.0
6m	0.4	0.6	0.6	0.0	-0.3	-0.7	-1.0
1y	0.8	0.7	0.4	-0.2	-0.3	-0.5	-0.7
2y	0.3	0.2	0.1	-0.1	-0.3	-0.6	-0.6
5y	-0.1	-0.2	-0.2	-0.2	-0.3	-0.5	-0.4
10y	0.1	0.1	0.1	-0.1	-0.2	-0.4	-0.5

Source: BofA Global Research

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Exhibit 18: 1y Z-Scores w/ PCA framework w/o rates directionality

Left side rich vs right side cheap when directionality considered

	1y	2y	3y	5y	7y	10y	30y
3m	1.2	1.2	1.2	0.6	-0.1	-0.8	-1.6
6m	1.2	1.3	1.2	0.4	-0.2	-0.8	-1.6
1y	1.4	1.1	0.7	-0.1	-0.4	-0.6	-1.2
2y	0.5	0.3	0.2	-0.2	-0.3	-0.6	-0.9
5y	-0.2	-0.2	-0.1	-0.1	-0.2	-0.3	-0.1
10y	0.3	0.4	0.4	0.4	0.3	0.1	0.3

Source: BofA Global Research

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Exhibit 20: ... and w/o directionality with rates

Grid rich on the upper left and gamma

	1y	2y	3y	5y	7y	10y	30y
1m	2.9	4.5	3.9	3.2	2.0	1.6	0.3
3m	4.2	2.8	2.7	2.6	1.9	0.6	2.4
6m	3.6	2.5	1.5	1.0	0.3	0.1	0.4
1y	2.7	1.3	2.9	0.2	-1.2	0.8	0.1
2y	1.6	0.5	0.9	0.4	-0.3	0.3	0.0
3y	0.7	1.5	0.9	0.5	-0.1	0.4	-1.7
4y	-0.8	1.5	1.5	0.6	1.8	0.2	-0.5
5y	-0.1	-2.6	0.4	0.3	0.9	-0.2	-0.3
10y	2.3	-0.9	-1.8	0.9	0.6	0.6	0.0
15y	0.2	-0.1	-0.9	2.3	-3.0	-0.3	1.4
30y	0.7	-0.1	0.6	1.3	-1.2	-2.3	1.7

Source: BofA Global Research

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Skew Relative Value

Exhibit 21: Skew 25% delta

Receiver skew rich on ULC and cheap in longer expiries (3m Z-Scores)

	1Y	2Y	3Y	5Y	7Y	10Y	30Y
1M	18.2	18.4	12.0	6.4	4.5	3.4	2.3
3M	22.7	19.2	12.6	6.7	4.8	4.0	2.8
6M	21.3	15.9	11.1	5.1	3.3	2.3	2.1
1Y	8.9	5.9	3.7	0.6	-0.9	-1.4	0.4
2Y	-5.6	-5.4	-5.2	-4.3	-4.0	-3.2	-0.8
3Y	-9.5	-8.8	-8.2	-6.6	-5.4	-4.3	-1.3
4Y	-9.6	-8.9	-8.5	-6.5	-5.5	-4.1	-1.3
5Y	-9.4	-9.2	-8.8	-6.3	-5.5	-4.0	-1.3
10Y	-3.7	-3.7	-3.2	-3.7	-3.7	-3.9	-1.5
15Y	-1.2	-1.2	-1.1	-1.6	-1.9	-2.3	-0.9
30Y	0.3	0.3	0.2	-0.1	-0.5	-1.0	-0.7

Source: BofA Global Research

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Exhibit 22: Skew 75% delta

Payer skew cheap on ULC and rich in longer expiries (3m Z-Scores)

	1Y	2Y	3Y	5Y	7Y	10Y	30Y
1M	-19.5	-19.1	-10.6	-4.1	-2.3	-1.4	-0.8
3M	-22.5	-16.9	-8.1	-1.7	-0.2	0.1	0.5
6M	-17.1	-9.7	-4.1	1.9	3.1	3.7	2.7
1Y	-1.3	1.6	3.6	6.1	7.2	7.3	4.6
2Y	11.4	11.1	10.8	9.8	9.2	8.5	5.4
3Y	15.1	14.5	13.9	12.3	11.4	10.3	6.5
4Y	15.5	14.9	14.5	12.7	12.0	11.0	7.2
5Y	15.2	14.9	14.5	12.6	12.1	11.2	7.4
10Y	11.8	11.6	11.2	11.3	11.2	10.9	7.3
15Y	11.3	11.1	10.8	10.8	10.5	10.0	6.4
30Y	11.0	10.8	10.7	10.5	10.2	9.5	6.1

Source: BofA Global Research

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Exhibit 23: Breakeven Widths for Costless Receiver Ladders

106bp breakeven width for 1y10y receiver ladders

	1Y	2Y	3Y	5Y	7Y	10Y	30Y
1M	61	65	56	47	40	35	26
3M	114	110	98	79	69	61	47
6M	157	146	129	105	91	83	66
1Y	187	169	153	128	114	106	88
2Y	190	181	173	159	148	138	117
5Y	218	211	206	202	194	186	164
10Y	259	251	248	236	227	215	192

Source: BofA Global Research

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Exhibit 24: Breakeven Widths for Costless Payer Ladders

124bp breakeven width for 1y10y payer ladders

	1Y	2Y	3Y	5Y	7Y	10Y	30Y
1M	41	46	44	41	37	33	24
3M	72	77	78	71	65	58	45
6M	105	110	108	100	91	85	67
1Y	164	159	153	138	132	124	97
2Y	237	227	218	197	184	171	135
5Y	334	324	316	292	279	262	207
10Y	371	363	354	346	337	325	255

Source: BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 25: 3m Z-Score Receiver Skew (w/o fwds & ATM direction)

Receiver skew rich on ULC & right side, cheap in LLC and belly

	1Y	2Y	3Y	5Y	7Y	10Y	30Y
1M	1.4	1.3	0.8	0.2	0.3	0.7	1.0
3M	1.0	0.5	-0.3	-1.0	-0.5	0.5	0.9
6M	0.7	0.5	-0.7	-0.6	-0.3	0.9	1.0
1Y	-1.5	-1.1	-1.0	0.3	0.0	1.0	1.3
2Y	-1.9	-1.6	-1.3	-0.5	0.1	0.9	0.9
5Y	-2.8	-2.8	-2.9	-2.2	-1.6	0.8	-0.1
10Y	-0.1	-0.5	-0.6	-0.7	-0.7	-1.0	-0.2

Source: BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 26: 3m Z-Score Payer Skew (w/o direction w/ fwds & ATM)

... payer skew right on LLC, cheap in ULC

	1Y	2Y	3Y	5Y	7Y	10Y	30Y
1M	-1.1	-0.7	0.0	0.7	0.9	0.5	0.1
3M	-1.2	-1.0	-0.1	0.3	0.0	-0.9	-1.0
6M	-1.0	-0.4	0.0	0.2	-0.5	-1.0	-1.1
1Y	1.2	1.2	1.1	-0.2	0.5	-1.1	-1.3
2Y	1.9	1.6	1.4	0.3	-0.3	-0.6	-1.2
5Y	3.0	3.0	3.0	2.6	2.3	1.1	0.8
10Y	0.0	0.4	0.5	0.7	2.1	2.8	3.0

Source: BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 27: Ratio of Payer/Receiver BE widths for Costless Ladders

Ratios of breakeven widths < 100% on the ULC and gamma

	1Y	2Y	3Y	5Y	7Y	10Y	30Y
1M	67%	70%	78%	88%	91%	93%	93%
3M	63%	70%	80%	90%	93%	94%	95%
6M	67%	76%	84%	96%	100%	102%	102%
1Y	88%	95%	100%	108%	116%	117%	110%
2Y	124%	125%	126%	124%	125%	124%	116%
5Y	153%	154%	154%	145%	144%	141%	126%
10Y	143%	144%	142%	147%	148%	151%	133%

Source: BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 28: 3m Z-Score Ratio of Payer/Receiver Skew

Z-Scores cheap payer vs receiver skew except for longer dated expiries

	1Y	2Y	3Y	5Y	7Y	10Y	30Y
1M	-1.1	-1.1	-0.8	-0.4	-0.3	-0.4	-0.5
3M	-1.0	-1.0	-0.7	-0.4	-0.4	-0.7	-0.7
6M	-1.0	-0.9	-0.7	-0.5	-0.5	-0.9	-0.8
1Y	-0.2	-0.3	-0.3	-0.7	-0.3	-1.1	-1.1
2Y	0.7	0.7	0.4	-0.1	-0.5	-0.8	-0.9
5Y	3.0	2.9	3.0	2.6	2.3	0.5	1.4
10Y	0.8	0.9	0.9	0.8	1.2	1.6	1.7

Source: BofA Global Research

BofA GLOBAL RESEARCH

Conditional Curve Trades

Exhibit 29: 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	12.0	21.4	27.8	11.2	19.0	9.7
6M	17.1	27.8	36.4	13.0	23.5	12.4
1Y	21.4	32.1	43.5	12.8	26.1	14.7
1.5Y	20.6	33.7	47.0	14.7	30.0	16.5
2Y	17.3	32.1	47.2	16.3	32.7	17.7

Source: BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 31: 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	-12.0	-21.4	-27.8	-11.2	-19.0	-9.7
6M	-17.1	-27.8	-36.4	-13.0	-23.5	-12.4
1Y	-21.4	-32.1	-43.5	-12.8	-26.1	-14.7
1.5Y	-20.6	-33.7	-47.0	-14.7	-30.0	-16.5
2Y	-17.3	-32.1	-47.2	-16.3	-32.7	-17.7

Source: BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 33: 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	-11.4	-20.8	-27.4	-10.8	-18.7	-9.3
6M	-16.7	-28.0	-36.6	-13.2	-23.7	-12.4
1Y	-22.4	-34.5	-45.0	-14.0	-27.2	-15.5
1.5Y	-22.9	-37.2	-49.7	-16.7	-32.1	-17.9
2Y	-19.6	-36.0	-50.1	-18.5	-35.1	-19.2

Source: BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 35: Bear Steepener (pickup to forwards for ATM)

Buy longer maturity payer, sell shorter maturity payer

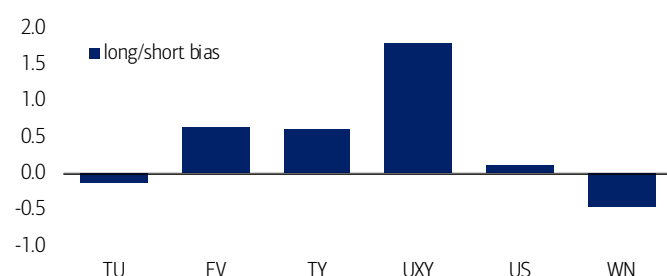
ATM	2/5s	2/10s	2/30s	5/10s	5/30s	10/30s
3M	11.4	20.8	27.4	10.8	18.7	9.3
6M	16.7	28.0	36.6	13.2	23.7	12.4
1Y	22.4	34.5	45.0	14.0	27.2	15.5
1.5Y	22.9	37.2	49.7	16.7	32.1	17.9
2Y	19.6	36.0	50.1	18.5	35.1	19.2

Source: BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 37: Analysis of proxies for futures positioning

... suggests slightly long bias in the belly



Source: BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 30: 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	17.9	30.2	39.0	15.7	26.9	14.2
6M	22.8	36.0	47.0	17.1	30.6	16.3
1Y	25.9	38.6	51.9	15.9	31.5	17.7
1.5Y	24.1	39.0	54.2	17.3	34.7	19.2
2Y	19.2	36.0	52.8	18.5	36.8	20.0

Source: BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 32: 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	-17.9	-30.2	-39.0	-15.7	-26.9	-14.2
6M	-22.8	-36.0	-47.0	-17.1	-30.6	-16.3
1Y	-25.9	-38.6	-51.9	-15.9	-31.5	-17.7
1.5Y	-24.1	-39.0	-54.2	-17.3	-34.7	-19.2
2Y	-19.2	-36.0	-52.8	-18.5	-36.8	-20.0

Source: BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 34: 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	-11.8	-24.5	-33.9	-14.2	-25.1	-13.4
6M	-17.9	-31.9	-43.3	-16.1	-30.0	-16.7
1Y	-24.9	-39.0	-52.2	-16.3	-33.1	-19.8
1.5Y	-25.5	-42.1	-57.3	-19.4	-38.4	-22.2
2Y	-22.4	-41.1	-57.9	-21.4	-41.3	-23.3

Source: BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 36: Bear Steepener (pickup to forwards for +25bp OTM)

Buy longer maturity payer, sell shorter maturity payer

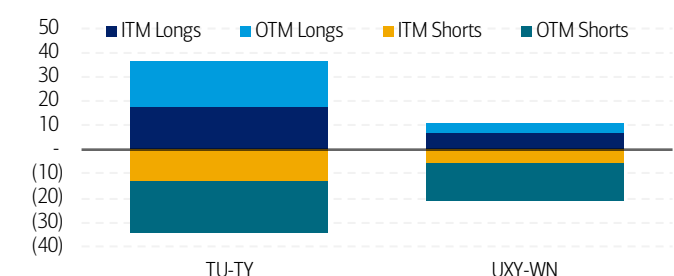
+25bp	2/5s	2/10s	2/30s	5/10s	5/30s	10/30s
3M	11.8	24.5	33.9	14.2	25.1	13.4
6M	17.9	31.9	43.3	16.1	30.0	16.7
1Y	24.9	39.0	52.2	16.3	33.1	19.8
1.5Y	25.5	42.1	57.3	19.4	38.4	22.2
2Y	22.4	41.1	57.9	21.4	41.3	23.3

Source: BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 38: Proxies for futures positioning across the curve

OTM longs in belly/frontend expose curve to bear flattening



Source: BofA Global Research

BofA GLOBAL RESEARCH

Forward Volatility

Exhibit 39: 6m Forward Volatility

102.5bp for 6m fwd 1y10y

	1y	2y	5y	10y	30y
1m	168.9	159.0	129.3	109.1	86.7
3m	164.0	149.7	123.5	105.9	85.1
6m	164.9	145.9	118.8	104.5	85.3
1y	150.4	141.1	120.5	102.5	83.7
2y	133.9	131.5	114.2	96.8	80.2
5y	108.2	104.9	96.3	85.6	71.9
10y	84.2	81.6	77.3	71.9	61.5

Source: BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 40: 6m Fwd vol as % ATM

95% of ATM for 6m fwd 1y10y

	1y	2y	5y	10y	30y
1m	101%	88%	89%	97%	102%
3m	95%	85%	86%	93%	97%
6m	96%	87%	87%	94%	98%
1y	90%	91%	96%	95%	96%
2y	94%	97%	96%	95%	95%
5y	98%	98%	97%	95%	95%
10y	96%	95%	96%	96%	97%

Source: BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 41: 3m Z-Score 6m Fwd vol % ATM

0.9 Z-Score for 6m fwd 1y10y

	1y	2y	5y	10y	30y
1m	-0.3	0.2	0.6	1.4	1.3
3m	-0.4	-0.3	-0.1	1.1	1.0
6m	-0.2	-0.2	-0.1	1.3	1.6
1y	-0.3	-0.3	0.8	0.9	1.2
2y	-0.3	0.3	0.3	0.5	0.7
5y	0.8	1.0	0.6	0.2	-0.1
10y	0.1	0.0	0.0	0.5	-0.3

Source: BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 42: 1y Forward Volatility

96.8bp for 1y fwd 1y10y

	1y	2y	5y	10y	30y
1m	139.1	129.1	115.5	97.8	80.2
3m	136.4	131.9	119.4	98.7	80.3
6m	133.8	131.0	119.4	98.2	80.3
1y	129.6	128.7	118.4	96.8	79.8
2y	127.6	127.5	110.6	92.6	77.0
5y	103.6	100.6	92.2	82.0	68.8
10y	81.4	78.9	75.2	70.0	59.7

Source: BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 43: 1y Fwd vol as % ATM

90% of ATM for 1y fwd 1y10y

	1y	2y	5y	10y	30y
1m	83%	71%	79%	87%	95%
3m	79%	75%	83%	87%	92%
6m	78%	78%	88%	88%	92%
1y	78%	83%	94%	90%	91%
2y	90%	94%	93%	91%	91%
5y	93%	94%	93%	91%	91%
10y	92%	92%	93%	94%	94%

Source: BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 44: 3m Z-Score 1y Fwd vol % ATM

-0.1 Z-Score for 1y fwd 1y10y

	1y	2y	5y	10y	30y
1m	-0.4	-0.2	0.2	0.8	1.0
3m	-0.6	-0.4	0.0	0.5	0.8
6m	-0.6	-0.5	0.1	0.3	1.0
1y	-0.8	-0.6	1.0	-0.1	0.5
2y	-0.4	1.1	0.0	0.0	0.4
5y	0.3	0.1	-0.3	-0.5	-0.7
10y	-0.2	-0.3	-0.3	0.0	-0.6

Source: BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 45: 2y Forward Volatility

91.0bp for 2y fwd 1y10y

	1y	2y	5y	10y	30y
1m	101.4	108.8	102.7	88.5	73.4
3m	107.2	111.7	104.2	89.5	74.0
6m	113.9	113.7	105.2	90.1	74.5
1y	122.1	117.1	106.7	91.0	75.2
2y	112.6	116.1	103.8	87.4	72.3
5y	98.2	95.7	88.8	78.7	65.2
10y	78.8	76.0	72.9	67.7	57.6

Source: BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 46: 2y Fwd vol as % ATM

84% of ATM for 2y fwd 1y10y

	1y	2y	5y	10y	30y
1m	61%	60%	70%	78%	87%
3m	62%	64%	72%	79%	84%
6m	67%	67%	77%	81%	85%
1y	73%	75%	85%	84%	86%
2y	79%	86%	88%	86%	86%
5y	89%	89%	89%	88%	86%
10y	90%	89%	90%	91%	91%

Source: BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 47: 3m Z-Score 2y Fwd vol % ATM

0.1 Z-Score for 2y fwd 1y10y

	1y	2y	5y	10y	30y
1m	-0.7	-0.5	-0.2	0.5	0.9
3m	-0.7	-0.6	-0.6	0.3	0.8
6m	-0.7	-0.7	-0.7	0.2	1.2
1y	-1.0	-1.0	-0.5	0.1	0.9
2y	-0.8	0.0	0.1	0.7	1.0
5y	0.3	0.2	0.3	-0.1	-0.5
10y	0.4	0.2	0.0	0.4	0.0

Source: BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 48: 3y Forward Volatility

86.8bp for 3y fwd 1y10y

	1y	2y	5y	10y	30y
1m	88.8	98.5	103.3	87.9	71.1
3m	90.0	100.7	104.1	88.3	71.3
6m	98.0	104.5	104.1	87.7	70.8
1y	111.4	109.6	103.8	86.8	70.4
2y	106.9	109.3	98.4	84.4	69.0
5y	92.7	90.4	84.2	74.5	61.3
10y	76.8	74.1	70.9	65.5	55.8

Source: BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 49: 3y Fwd vol as % ATM

81% of ATM for 3y fwd 1y10y

	1y	2y	5y	10y	30y
1m	53%	54%	71%	78%	84%
3m	52%	57%	72%	78%	81%
6m	57%	62%	76%	79%	81%
1y	67%	71%	83%	81%	81%
2y	75%	81%	83%	83%	82%
5y	84%	84%	85%	83%	81%
10y	87%	87%	88%	88%	88%

Source: BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 50: 3m Z-Score 3y Fwd vol % ATM

0.8 Z-Score for 3y fwd 1y10y

	1y	2y	5y	10y	30y
1m	-0.7	-0.4	0.3	1.0	1.2
3m	-0.8	-0.5	0.1	1.1	1.3
6m	-0.8	-0.6	0.3	1.3	1.9
1y	-1.0	-0.6	1.0	0.8	1.5
2y	-0.2	0.6	0.4	1.0	1.0
5y	0.0	-0.1	0.0	-0.4	-0.6
10y	0.9	0.8	0.0	0.0	0.4

Source: BofA Global Research

BofA GLOBAL RESEARCH

Ratios implied/delivered

Exhibit 51: Implied vs. Delivered (21d) Ratio

Ratios of Implied to 21d delivered still in gamma and the right side

	1y	2y	3y	5y	7y	10y	30y
1m	119%	109%	104%	108%	109%	113%	117%
3m	106%	102%	104%	107%	110%	114%	122%
6m	92%	94%	98%	102%	106%	113%	122%
1y	85%	90%	96%	101%	107%	115%	125%
2y	96%	105%	111%	118%	123%	127%	130%

Source: BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 52: Implied vs. Delivered (63d) Ratio

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

	1y	2y	3y	5y	7y	10y	30y
1m	59%	73%	81%	88%	88%	89%	83%
3m	55%	70%	81%	87%	88%	89%	85%
6m	55%	72%	81%	85%	87%	89%	85%
1y	68%	79%	84%	85%	87%	89%	83%
2y	84%	88%	90%	91%	90%	89%	80%

Source: BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 53: 3m Z-Scores for Implied vs. Delivered (21d) Ratio

Ratios of implied/21d delivered rich virtually across the grid

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

Source: BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 54: 3m Z-Scores for Implied vs. Delivered (63d) Ratio

Ratios of implied/63d delivered cheap across the grid

	1y	2y	3y	5y	7y	10y	30y
1m	-1.3	-1.2	-1.2	-1.0	-1.0	-1.0	-1.0
3m	-1.1	-1.2	-1.0	-1.0	-0.9	-0.9	-0.8
6m	-1.1	-1.1	-1.0	-0.9	-0.8	-0.7	-0.9
1y	-0.9	-0.7	-0.6	-0.6	-0.5	-0.3	-0.6
2y	-0.5	-0.3	-0.2	0.0	0.0	-0.2	-0.5

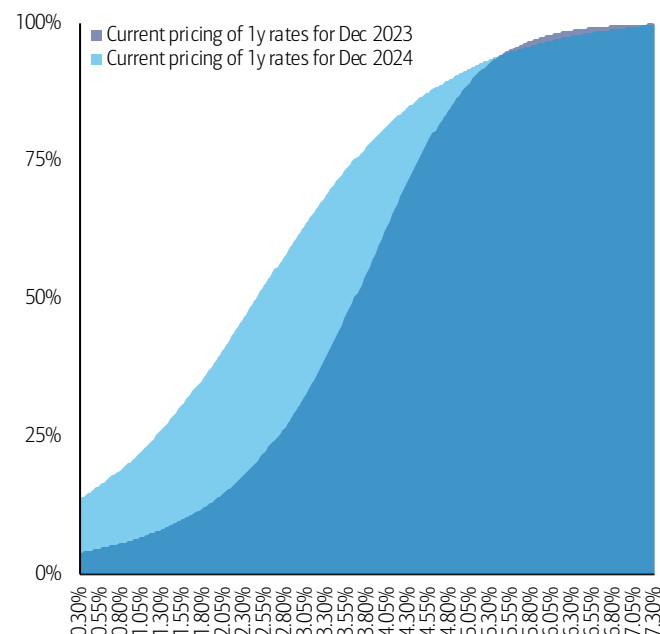
Source: BofA Global Research

BofA GLOBAL RESEARCH

Rates probability distributions

Exhibit 55: CDF for 1y SOFR rates at end-2023 and end-2024

1y rate cumulative distribution functions

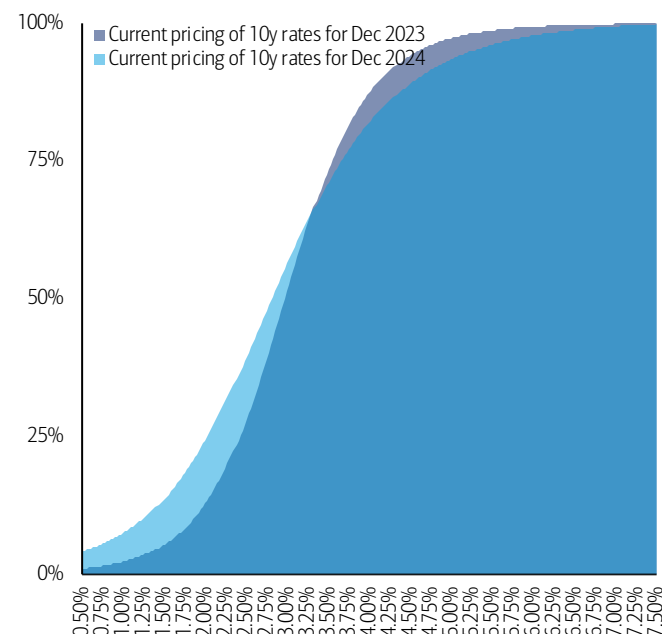


Source: BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 56: CDF for 10y SOFR rates at end-2023 and end-2024

10y rate cumulative distribution functions



Source: BofA Global Research

BofA GLOBAL RESEARCH

Trade activity

Exhibit 57: 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	400	460			820		1852		175	3807
1m	500	2055	1920		690		3137	408	1983	13554
3m	3395	910	375	240	3854		1605	245	1645	14634
6m	4894	1835	240		665		1277	100	50	9111
1y	12451	3810	750		3534	516	2021	165	367	23614
2y	1300	2760	1440		950	510		156	626	7742
3Y	480	250	1046		450	310	1120	77	110	3843
4Y	200	500			242			100		1042
5Y	500	250			365		545		130	1790
7Y	250		60		420	40	100	50	125	1045
10Y		250			83		475	38	45	891
20Y								10		10
30Y									130	130
	24370	13080	5831	240	12073	1376	12132	1349	5386	81213

Source: BofA Global Research; SDR; Bloomberg

BofA GLOBAL RESEARCH

Exhibit 58: 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		460			540		871		75	2246
1m	1500	1834			4717		1088	1983	775	13468
3m	1685	910		240	1155		1328	320	675	8298
6m	2224	1835	240		810		940	340	835	9234
1y	9040	2460	450		2854	346	2788	165	629	18732
2y	4600	2790	480		2470	410	56	156	716	11678
3Y	330	590	420		2130	215	2000	77	110	5872
4Y	200	500			242			100	26	1068
5Y	500	250			330		885		130	2095
7Y	250				670	140	100	50	125	1335
10Y		250			83		550	38	45	966
20Y								45		45
30Y									170	170
	20329	11879	1590	240	16001	1111	10606	3274	4311	75207

Source: BofA Global Research; SDR; Bloomberg

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Exhibit 59: 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		480								480
1m	1000	150					65		60	1283
3m	920						6		25	951
6m							50			50
1y	1000						135			1135
2y		200		240		300	50			790
3Y										
4Y							270			270
5Y					45					45
7Y							90			90
10Y							200			200
20Y										
30Y										
	2920	830		240	45	300	866		85	5294

Source: BofA Global Research; SDR; Bloomberg

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Formosa issuance

Exhibit 60: 2022 Formosa issuance (\$m)

14.8bn total issuance for the year '22

	2	5	7	10	15	20	25	30
1			75	513	20			
2		40		640				
3				110	20			125
4		15		179	50			
5				20	45	220	80	10,226
7			30					
10				2,000				363
15								
20								
25								
30								

Source: BofA Global Research, Bloomberg

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Exhibit 61: 2023 Formosa issuance YTD (\$m)

Very limited issuance YTD

	2	5	7	10	15	20	25	30
1								
2				280				
3		40						
4				160				
5				53			15	
7								
10								
15								
20								
25								
30								

Source: BofA Global Research, Bloomberg

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Exhibit 62: Formosa issuance (\$m) since 2014

Peak issuance concentrated on the 5y30y tenor

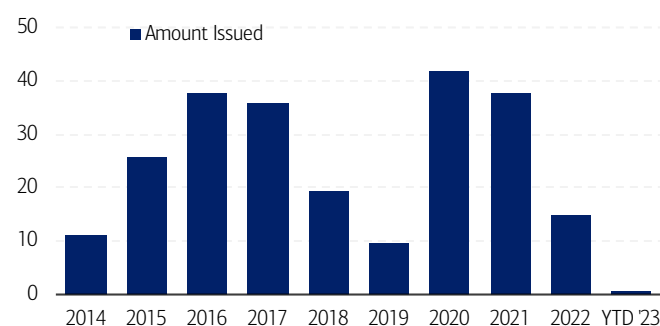
	2	5	7	10	15	20	25	30
1		205	75	1033	462	840		18054
2		40		1074		1485		22177
3		40		110	20	240	225	15536
4		15		339	50	25	275	2441
5				73	445	1497	368	111658
7			30					5624
10				2000				4464
15								
20								
25								
30								5500

Source: BofA Global Research, Bloomberg

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Exhibit 63: Total issuance per year since 2014 (\$bn)

Rough 0.5bn issuance YTD



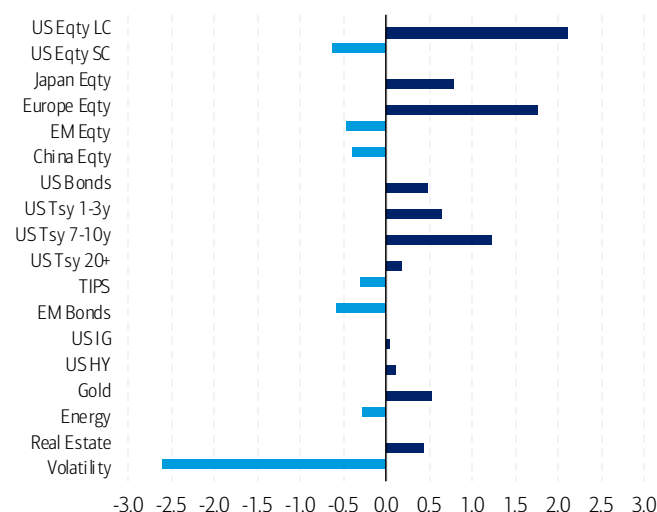
Source: BofA Global Research, Bloomberg

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Allocation bias from ETF flows

Exhibit 64: Allocation bias from ETF flows – week ending 4/28

Short equity vol bias persists as duration bias increases slightly

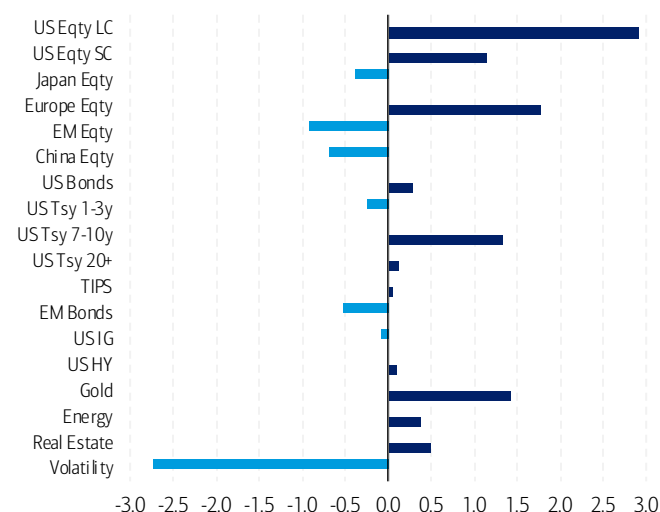


Source: BofA Global Research

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Exhibit 65: Allocation bias from ETF flows – week ending 4/21

Short equity vol bias



Source: BofA Global Research

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Notes

Exhibit 12: 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 13/15/17: 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 14/16/18: 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 23/24: 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 25/26: 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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