

US Rates Viewpoint

Vol views – March Madness

Crisis levels for volatility

Volatility reached crisis levels over the past week. The vol spike has been driven by deteriorating financial conditions against a backdrop of stress in bank stocks. These have led to both a frontloading of recession risks and an increase of hard landing probabilities. The options market is now pricing (using 1m1m SOFR CDF) c.34% probability for a rate cut at the March FOMC meeting.

We continue to see potential for further moves lower in yields. 10yT yields could push towards the 1.25-2.75% bottom half of the steady state range in harder landing scenarios. Lower 2yT yields from here, however, become more contingent on scenarios where the Fed cuts rates near term – very aggressive scenarios where the market reprices the policy through to c.2.75-3% by 1Q24 may push 2yT yields to c.3.25%.

The outlook for volatility is also contingent on the view for the level of systemic risk in the recent stress, and the potential for it to persist. A further deterioration of risk sentiment from here could push 1y10y vol beyond the recent cycle highs. We see the potential for a 15-20bp normal move (135-140bp for normal vol – into a c.45-50% regime for lognormal vol from c.30-35% currently), and a bias towards the left side to continue to show some outperformance.

Medium term, the vol outlook is likely weighed down by a convergence of macro fundamentals to a lower growth and lower inflation baseline. However, even in a context where risk-off sentiment starts to fade, the realization of more significant tail risks from higher for longer policy rates to broader financial stability conditions is likely to cap the near-term downward momentum, in our view.

Positioning-wise, contexts of high uncertainty and volatility support a bias towards exposures where investors pay a premium but limit or eliminate all together the sensitivity to downside scenarios terminally beyond the upfront premium. Receiver spreads (which we recommend recently as a way to fade reacceleration expectations) and 2s10s curve caps, continue to make sense in this context. Long dated vega exposures (one of the themes of our vol outlook for '23) has also to a large extent fulfilled its role as a macro hedge in portfolios.

20 March 2023Rates Research
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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

GFC – Great Financial crisis

c. – circa (approximately)

CDF – Cumulative Distribution Function

PDF – Probability Density Function

For a list of our open and closed trades, please see our [Global Rates Weekly](#)

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Timestamp: 20 March 2023 01:25PM EDT

Crisis levels for volatility

Volatility reached crisis levels over the past week.

- 1y1y vol, which represents uncertainty around Fed policy, exceeded the '08 crisis levels and reached 203bp (192bp currently – see Exhibit 1)
- 1y10y vol reached 133bp, not seen since the Oct '22 10yT cycle peak (currently 116bp around the top end of the 100-120bp expected range for '23 – see Exhibit 2)
- The inversion of the volatility term structure reached levels not seen since the peak of the covid crisis (50bp inversion for the 1m10y vs 1y10y vol spread – Exhibit 4).

Exhibit 1: 1y1y volatility exceeding '08 levels (currently 192bp)

1y1y volatility reached 203bp this week, reflecting significant uncertainty around the Fed policy trajectory



Source: BofA Global Research

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The volatility spike has been driven by deteriorating financial conditions against a backdrop of stress in bank stocks. These have led to both a frontloading of recession risks and an increase of hard landing probabilities – the options market is now pricing (using 1m1m SOFR CDF) 51% probability of an on-hold or easing Fed at the March FOMC meeting (34% probability for a cut + 17% probability for on-hold), and only 49% probability of a 25bp rate hike.

Exhibit 2: 1y10y vol and expected '23 range

1y10y vol in the middle of the expected range



Source: BofA Global Research; Bloomberg

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Exhibit 3: 1y1y vs 1y10y vol spread at

... reached c.70bp inversion this week

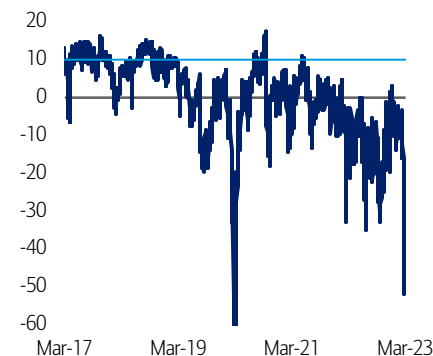


Source: BofA Global Research; Bloomberg

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Exhibit 4: 1m10y vs 1y10y vol spread

... reached c.50bp inversion this week



Source: BofA Global Research; Bloomberg

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Despite being off from the highs, current vol levels continue to reflect the type of stress that generally drives a pullback in risk and carry trades (and indeed we are starting to see some reversal of the rotation into EM and credit of late '22 and early '23) and supports demand for USTs and some degree of overshoot in a risk-off dynamic.

Significantly also, the VAR shock that this type of vol event represents generally creates scope for pressures on liquidity in Treasury space from variation margin on positions and margin calls, which may whipsaw USTs and further support volatility.



Downside risks

In [US rates FAQ: recent bank stress](#) we estimated for the magnitude of potential moves for rates and volatility from here:

- **For 10y rates:** the recent stress reinforces our bullish bias in the range as it highlights material tail risks for the economy and increases the likelihood of harder landing scenarios. This creates the potential for more significant richening of yields relative to the steady state. We argued recently that the medium-term range for 10yT is c.1.25-4.25% (see [Postcard from Canada & Mexico](#)), and harder landing scenarios contain the potential for yields to reach mid-2% levels (the middle of the 1.25-2.75% bottom half of the range).
- **The 2y rates** outlook is contingent: on the terminal level, the timing of the first cut in the cycle, how quickly the Fed is priced to reach the neutral, and the degree of overshoot of the neutral the market is willing to price for the Fed. The recent stress has driven a shift in expectations for most of these (see Exhibit 5 and Exhibit 6).

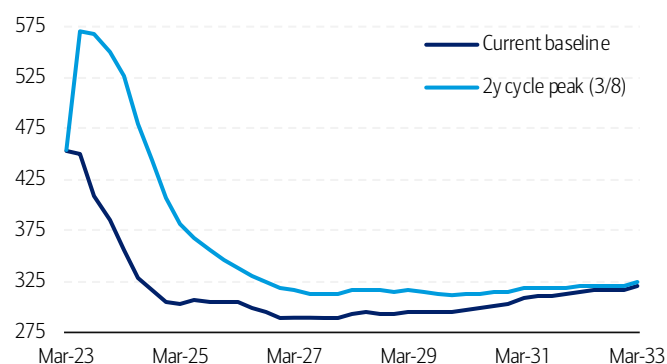
A scenario where the fed stays on hold in the 4.5-4.75% range, delivers the first cut by mid-2023, and converges to a neutral view in the 2.25-2.5% range by 4Q25 implies 2yT yields in the c.3.85% context.

A further rally from these levels becomes contingent on higher probabilities for rate cuts in March: (1) the repricing of a more aggressive scenario where the market starts to price rate cuts in March and a policy through around 2.75-3% reached at a relatively steady pace by 1Q25, implies a level for the 2yT of c.3.55%; (2) an even more aggressive scenario where the market reprices a c.2.75-3% policy through by 1Q24 would push 2yT yields to around 3.25%.

- **For volatility,** a further deterioration of risk sentiment from here may push 1y10y vol beyond the cycle highs. We see the potential for another 15-20bp normal move (135-140bp for normal vol – into a c.45-50% regime for lognormal vol from levels c.30-35% currently), and a bias towards some left side outperformance.

Exhibit 5: Repricing of the policy path since the 2y cycle peak on 3/8

Significant repricing of terminal along with 20bp lower policy trough



Source: BofA Global Research

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Exhibit 6: Pricing of the timing of the Fed pivot to on-hold

Fed pivot over the last week priced over a 1-2m horizon



Source: BofA Global Research

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The other side of the spectrum of risk...

At the other side of the range of outcomes, one has scenarios where policy makers start to be more proactive and less reactive to the situation on the ground, and are able to stabilize the market and avoid significant headwinds for the economy from deteriorating consumer sentiment and tightening of lending standards.

These scenarios become increasingly unlikely as the crisis drags on, but generally they do imply some upside for yields. However:



- The market is likely to continue to price significant and persistent tail risks from higher policy rates for longer. The Fed has a more significant challenge ahead to balance the tradeoffs between price stability vs. both full employment and financial stability, and this caps the potential for the repricing of policy tightening beyond a tentative one-hike-at-a-time sort of framework.
- Even in these more positive scenarios, the crisis has likely changed the market bias more decisively towards trading the range with a bullish bias (see [Postcard from Canada & Mexico](#)), i.e., adding to duration with a higher level of conviction at the top end of the range, and less scope for shorts at the bottom end. This likely caps the potential for 10yT to reach levels around 4%.

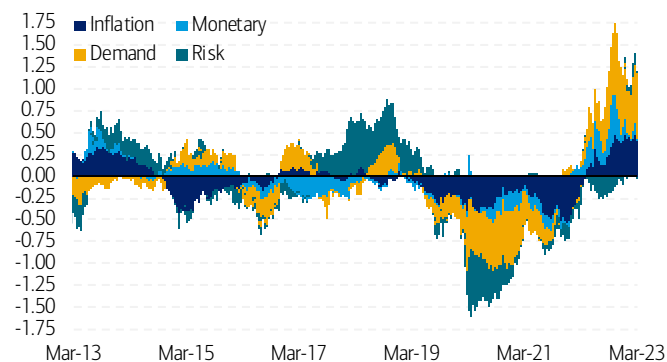
Our framework for the decomposition of the 10yT dynamic (in terms of risk, monetary policy, demand, and inflation shocks) corroborates these views to some extent. We see currently: risk and monetary policy shocks relatively flat; and the cheapening relative to the steady state (c.2.25-2.5% currently) driven primarily by demand and inflation (55bp and 40bp respectively – see Exhibit 7). The risks dynamic will have to do most of the initial heavy lifting for a material UST bearish momentum to materialize, and the threshold for that seems high.

Significantly also, our global yield framework now shows 10yT c.25bp rich to global yields, consistent with the recent risk off tone (see Exhibit 8). Scenarios where the recent risk off sentiment fades near-term therefore imply c.25bp bearish potential for 10yT towards fair levels vs. global yields, or c.3.75%. A more significant selloff from there would likely need to be supported by a broader bearish momentum in the DM sovereign complex.

We continue to favor 6m10y costless payer ladders in these scenarios, as we see the magnitude of the potential underperformance of rates relative to the forwards somewhat capped (currently -4bp, see [Too fast too soon](#)).

Exhibit 7: Decomposition of the 10yT dynamic

Monetary policy and risk shocks relatively flat currently... demand and inflation continue to drive some cheapening vs c.2.25-2.5% steady state

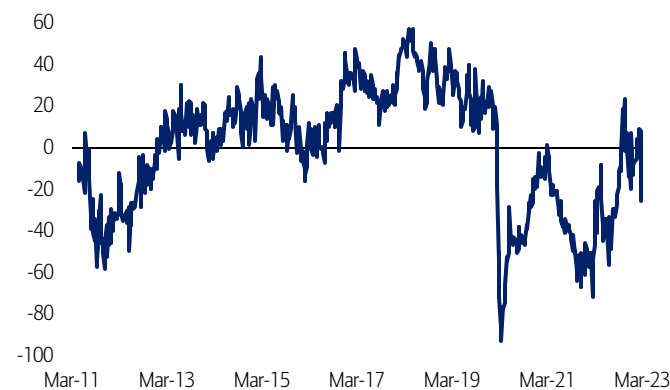


Source: BofA Global Research

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Exhibit 8: Residual of the global yield framework for the 10yT

10yT currently 25bp rich to global yields.



Source: BofA Global Research

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Positioning wise...

Broadly, however, contexts of high uncertain and volatility support a bias towards positions where investors pay a premium but limit or eliminate all together the exposure to downside scenarios terminally beyond the upfront premium. Receiver spreads (which we recommend recently in [reacceleration, resilience & volatility](#) as a way to fade reacceleration expectations) and 2s10s curve caps (see [UST curve nearing inflection with slowdown risks](#)), continue to make sense in this context. Long dated vega exposures (which was one of the themes of our vol outlook for '23 – see [Embracing the Pivot](#)) has also to a large extent fulfilled its role as a macro hedge in portfolios.



Levels and Recent Moves

Exhibit 9: ATM Normal Volatility Grid

116.1bp for 1y10y volatility on Friday's close

	1Y	2Y	3Y	5Y	7Y	10Y	30Y
1M	302.7	271.7	252.9	210.9	177.1	164.8	121.9
3M	272.3	238.8	208.6	174.5	152.6	143.0	111.6
6M	246.3	210.2	184.5	155.3	136.3	127.3	103.1
1Y	197.6	173.0	160.0	136.8	123.8	116.1	94.4
2Y	158.8	149.9	142.2	125.8	115.5	109.4	89.7
3Y	139.5	134.1	129.1	116.5	108.4	102.6	84.9
4Y	126.6	122.3	119.3	110.2	103.0	98.0	81.6
5Y	116.7	113.3	110.8	104.9	99.6	95.0	78.8
10Y	89.7	87.5	86.0	83.2	80.1	77.2	65.6
30Y	62.4	60.9	59.9	58.0	56.3	54.3	47.3

Source: BofA Global Research

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Exhibit 10: ATM Volatility Grid - 3m Z-Scores

Grid rich on 3m Z-Scores, particularly the ULC

	1Y	2Y	3Y	5Y	7Y	10Y	30Y
1M	4.5	3.9	3.7	3.3	2.9	2.8	1.6
3M	4.3	3.7	3.0	2.7	2.3	2.1	1.1
6M	4.1	3.5	2.8	2.3	1.6	1.3	0.7
1Y	3.2	2.5	2.0	1.3	0.9	0.7	0.2
2Y	2.0	1.8	1.5	1.0	0.6	0.6	0.3
3Y	1.4	1.4	1.3	0.8	0.5	0.5	0.3
4Y	1.1	1.1	1.1	0.8	0.5	0.6	0.5
5Y	0.9	0.9	1.0	0.9	0.7	0.8	0.7
10Y	0.5	0.6	0.6	0.7	0.6	0.6	0.8
30Y	0.9	1.0	1.0	1.2	1.2	1.3	1.6

Source: BofA Global Research

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Exhibit 11: ATM Normal Volatility Grid - CoW

Upper left side and gamma outperformed on the grid over the last week

	1Y	2Y	3Y	5Y	7Y	10Y	30Y
1M	169.3	98.9	82.5	50.0	30.1	28.4	12.9
3M	134.0	81.3	52.9	27.5	17.4	16.3	8.9
6M	95.3	52.4	30.8	14.8	5.3	5.2	1.7
1Y	37.4	19.1	11.6	3.2	-0.7	-0.5	-2.7
2Y	7.9	7.4	4.5	1.0	-0.2	-0.1	-2.0
3Y	3.7	3.7	2.2	0.9	0.2	0.3	-0.8
4Y	3.4	3.3	3.1	2.0	0.9	0.9	0.3
5Y	2.2	2.7	2.6	2.3	2.1	2.1	0.8
10Y	1.5	1.4	1.4	1.4	1.2	1.3	0.9
15Y	0.2	0.2	0.2	0.2	0.1	0.2	0.1
30Y	1.6	1.6	1.5	1.5	1.4	1.4	1.2

Source: BofA Global Research

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Exhibit 12: ATM Straddle Premiums (indicative only)

7.6% straddle premiums for 1y10y

	1Y	2Y	3Y	5Y	7Y	10Y	30Y
1M	0.7%	1.2%	1.6%	2.2%	2.6%	3.2%	5.6%
3M	1.1%	1.8%	2.4%	3.2%	3.8%	4.9%	9.0%
6M	1.3%	2.3%	2.9%	4.0%	4.7%	6.1%	11.5%
1Y	1.5%	2.6%	3.5%	4.8%	6.0%	7.6%	14.6%
2Y	1.6%	3.0%	4.3%	6.1%	7.6%	9.8%	19.1%
3Y	1.7%	3.2%	4.6%	6.7%	8.5%	10.9%	21.6%
4Y	1.7%	3.3%	4.8%	7.1%	9.0%	11.7%	23.3%
5Y	1.7%	3.3%	4.8%	7.3%	9.5%	12.3%	24.6%
10Y	1.6%	3.1%	4.5%	7.1%	9.2%	12.2%	25.9%
15Y	1.4%	2.8%	4.0%	6.3%	8.3%	11.1%	25.0%
30Y	1.2%	2.3%	3.3%	5.2%	7.0%	9.5%	23.4%

Source: BofA Global Research

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Exhibit 13: 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 14: 3m10y vs. 3m2y Normal Volatility

Left side richened materially vs right side over the last week

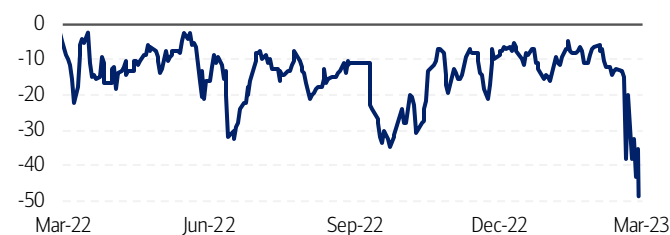


Source: BofA Global Research; Bloomberg

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Exhibit 15: 1y10y vs. 1m10y Normal Volatility

Vol term structure inversion exacerbated last week

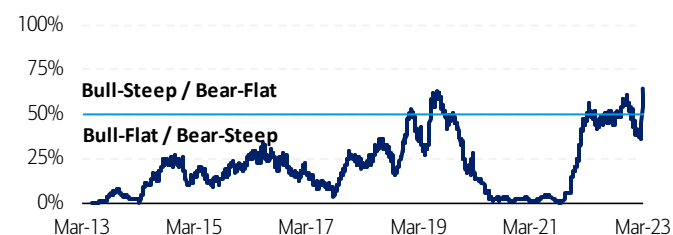


Source: BofA Global Research; Bloomberg

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Exhibit 16: 2s10s curve directionality only 40% frontend driven

Un-anchoring of frontend since Oct '21... going the other wat...



Source: BofA Global Research

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Volatility Grid Relative Value

PCA Z-SCORES

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

Rich ULC and right, cheap/fair belly on 3m Z-Scores

	1y	2y	3y	5y	7y	10y	30y
3m	5.0	-3.9	4.7	-4.6	-1.4	1.7	2.9
6m	5.9	-1.3	-7.7	-4.5	-0.8	3.6	2.6
1y	-0.4	-3.4	-5.8	-3.4	-2.1	1.6	1.7
2y	-2.1	-1.8	-3.2	0.5	2.3	3.2	1.8
5y	2.1	3.3	2.7	2.1	2.8	2.6	0.2
10y	1.9	1.5	1.0	0.2	0.4	0.2	-1.3

Source: BofA Global Research

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Exhibit 19: 6m Z-Scores w/ PCA framework

Rich ULC and right, cheap/fair belly on 6m Z-Scores

	1y	2y	3y	5y	7y	10y	30y
3m	6.0	-1.8	5.8	-3.7	-1.4	1.9	4.9
6m	5.6	-1.5	-8.2	-3.8	-2.2	2.0	4.6
1y	-1.0	-4.3	-6.6	-5.4	-4.0	2.1	3.5
2y	-3.9	-3.6	-4.6	-1.8	0.7	4.1	2.7
5y	0.6	1.1	1.0	1.8	3.1	3.5	2.0
10y	1.4	1.2	1.1	1.1	1.2	1.3	-2.6

Source: BofA Global Research

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Exhibit 21: 1y Z-Scores w/ PCA framework

Rich ULC and right, cheap/fair belly on 1y Z-Scores

	1y	2y	3y	5y	7y	10y	30y
3m	5.6	6.4	-2.2	-0.6	0.1	3.7	0.6
6m	5.2	-0.6	-5.5	-3.1	-2.6	1.9	0.4
1y	-2.7	-5.2	-7.0	-6.0	-4.1	2.4	0.1
2y	-4.4	-3.2	-2.9	-0.8	2.1	5.2	1.5
5y	1.0	2.3	3.1	4.0	4.5	5.3	4.2
10y	4.8	4.8	4.9	4.8	4.6	4.5	4.3

Source: BofA Global Research

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Exhibit 23: 3m Z-Scores w/ modified PCA framework ...

Rich left side 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 18: 3m Z-Scores w/ PCA framework w/o rates directionality

Rich left side and gamma when directionality is considered

	1y	2y	3y	5y	7y	10y	30y
3m	5.5	4.4	3.4	3.1	2.4	2.1	0.5
6m	5.2	4.2	3.1	2.4	1.3	0.8	-0.2
1y	3.8	2.7	2.0	0.9	0.1	-0.1	-0.8
2y	1.9	1.5	1.2	0.3	-0.2	-0.3	-0.7
5y	0.2	0.2	0.3	0.2	0.0	0.0	-0.1
10y	-0.3	-0.3	-0.2	-0.1	-0.3	-0.2	0.1

Source: BofA Global Research

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Exhibit 20: 6m Z-Scores w/ PCA framework w/o rates directionality

Rich left side and gamma when directionality is considered

	1y	2y	3y	5y	7y	10y	30y
3m	5.8	4.9	3.7	2.5	1.5	1.2	0.3
6m	5.2	4.1	2.8	1.5	0.5	0.2	-0.3
1y	3.4	2.1	1.4	0.3	-0.3	-0.4	-0.9
2y	1.3	1.0	0.7	-0.1	-0.5	-0.5	-0.8
5y	-0.2	-0.1	0.0	0.0	-0.2	-0.1	-0.1
10y	-0.4	-0.3	-0.2	0.0	-0.2	-0.1	0.3

Source: BofA Global Research

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Exhibit 22: 1y Z-Scores w/ PCA framework w/o rates directionality

Rich left side and gamma when directionality is considered

	1y	2y	3y	5y	7y	10y	30y
3m	6.2	5.3	4.2	3.2	2.3	2.2	0.9
6m	5.6	4.5	3.4	2.2	1.2	1.1	0.3
1y	3.8	2.6	2.1	1.0	0.5	0.4	-0.3
2y	1.9	1.7	1.5	0.7	0.3	0.4	-0.1
5y	0.6	0.8	0.9	0.9	0.7	0.9	0.8
10y	0.7	0.8	0.9	1.1	0.9	1.1	1.6

Source: BofA Global Research

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Exhibit 24: ... and w/o directionality with rates

Rich left side and gamma when directionality is considered

	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 25: Skew 25% delta

Receiver skew in the ULC rich on 3m Z-Scores across the grid

	1Y	2Y	3Y	5Y	7Y	10Y	30Y
1M	8.8	7.2	6.3	5.1	3.0	0.4	0.9
3M	27.4	21.0	16.9	9.7	6.4	2.9	2.6
6M	23.6	17.9	14.0	5.6	3.2	0.4	0.9
1Y	13.4	9.7	7.2	-0.3	-1.5	-2.7	-0.8
2Y	-3.0	-3.5	-4.3	-4.9	-4.9	-4.7	-1.5
5Y	-7.8	-7.8	-7.7	-6.8	-6.1	-5.2	-1.7
10Y	-4.0	-3.8	-3.4	-3.9	-4.0	-4.4	-2.2
30Y	-0.6	-0.6	-0.7	-0.9	-1.3	-1.9	-1.4

Source: BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 26: Skew 75% delta

Payer skew on ULC cheap on 3m Z-Scores across the grid

	1Y	2Y	3Y	5Y	7Y	10Y	30Y
1M	-32.3	-26.5	-22.4	-12.6	-7.8	-3.6	-2.2
3M	-24.0	-16.7	-12.2	-4.5	-1.3	2.2	1.5
6M	-19.8	-12.9	-8.5	0.8	2.8	5.3	3.9
1Y	-7.9	-3.5	-0.3	7.0	7.8	8.6	5.8
2Y	9.0	9.4	10.0	10.2	9.9	9.5	6.0
5Y	12.9	12.9	12.8	12.1	11.8	11.5	7.5
10Y	12.1	11.9	11.4	11.6	11.2	10.8	6.9
30Y	10.2	10.1	10.0	10.0	9.6	9.2	5.7

Source: BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 27: Breakeven Widths for Costless Receiver Ladders

112bp breakeven width for 1y10y receiver ladders

	1Y	2Y	3Y	5Y	7Y	10Y	30Y
1M	103	92	85	69	56	51	37
3M	173	146	126	100	86	77	60
6M	218	181	156	120	103	93	76
1Y	230	196	177	138	122	112	94
2Y	220	206	193	168	154	145	124
5Y	237	229	223	213	202	194	170
10Y	263	257	254	242	232	221	196

Source: BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 28: Breakeven Widths for Costless Payer Ladders

136bp breakeven width for 1y10y payer ladders

	1Y	2Y	3Y	5Y	7Y	10Y	30Y
1M	80	72	68	58	50	48	36
3M	122	110	98	86	78	76	59
6M	158	137	123	113	102	100	81
1Y	187	169	161	153	141	136	108
2Y	253	242	233	209	195	185	146
5Y	329	322	316	299	286	275	215
10Y	379	371	362	356	343	331	258

Source: BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 29: 3m Z-Score Receiver Skew (w/o fwds & ATM direction)

Receiver skew rich in gamma

	1Y	2Y	3Y	5Y	7Y	10Y	30Y
1M	0.3	0.9	1.1	1.0	1.2	0.7	1.5
3M	3.7	4.1	4.5	4.3	3.5	2.4	2.7
6M	3.5	4.0	4.8	4.9	3.9	3.5	2.8
1Y	1.4	1.6	2.7	-0.2	0.3	1.4	1.1
2Y	-0.5	-0.3	-0.2	-1.0	-0.7	0.9	0.9
5Y	-1.8	-1.9	-2.0	-1.9	-1.8	-1.3	-1.1
10Y	-1.9	-2.0	-2.0	-1.9	-1.8	-1.7	-1.5

Source: BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 30: 3m Z-Score Payer Skew (w/o direction w/ fwds & ATM)

Payer skew cheap in gamma

	1Y	2Y	3Y	5Y	7Y	10Y	30Y
1M	-1.9	-1.7	-1.7	-1.4	-1.0	-0.8	-0.5
3M	-2.1	-1.6	-2.8	-1.7	-1.2	-0.4	-1.0
6M	-2.6	-2.9	-4.0	-2.5	-1.9	-1.5	-1.5
1Y	-1.5	-1.5	-2.7	0.4	0.4	-1.6	-0.9
2Y	0.2	0.0	-0.2	0.7	0.7	-1.3	-1.3
5Y	1.1	1.4	1.1	0.5	0.1	-0.6	0.7
10Y	1.6	1.7	1.7	1.7	1.7	1.7	1.6

Source: BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 31: Ratio of Payer/Receiver BE widths for Costless Ladders

Ratios of breakeven widths < 100% only on the ULC

	1Y	2Y	3Y	5Y	7Y	10Y	30Y
1M	77%	79%	80%	85%	89%	95%	95%
3M	71%	76%	78%	87%	91%	99%	98%
6M	72%	76%	79%	94%	99%	107%	106%
1Y	81%	86%	91%	111%	116%	122%	115%
2Y	115%	117%	121%	124%	127%	127%	117%
5Y	139%	141%	142%	141%	141%	141%	126%
10Y	144%	144%	143%	147%	148%	149%	131%

Source: BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 32: 3m Z-Score Ratio of Payer/Receiver Skew

Cheap payer vs receiver skew virtually across gamma and intermediates

	1Y	2Y	3Y	5Y	7Y	10Y	30Y
1M	-3.4	-3.7	-3.8	-3.5	-2.8	-2.0	-2.1
3M	-3.7	-3.8	-4.0	-3.4	-3.2	-2.1	-2.4
6M	-3.3	-3.6	-4.1	-3.4	-2.9	-2.4	-2.1
1Y	-2.1	-2.2	-2.6	-1.0	-0.6	-0.9	-0.9
2Y	-0.2	-0.2	-0.4	0.2	0.2	-0.9	-1.1
5Y	1.6	1.7	2.1	1.7	1.2	0.3	1.6
10Y	2.3	2.1	2.1	2.0	1.8	1.6	1.7

Source: BofA Global Research

BofA GLOBAL RESEARCH

Conditional Curve Trades

Exhibit 33: Bull Flattener (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	24.3	32.7	40.1	12.0	22.0	11.8
6M	28.4	38.8	47.2	14.6	25.3	12.6
1Y	25.9	37.8	49.5	14.7	28.6	15.5
1.5Y	26.3	39.9	54.2	15.9	32.5	18.1
2Y	23.9	38.4	54.8	16.3	34.7	19.8

Source: BoFA Global Research

BoFA GLOBAL RESEARCH

Exhibit 35: 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	-24.3	-32.7	-40.1	-12.0	-22.0	-11.8
6M	-28.4	-38.8	-47.2	-14.6	-25.3	-12.6
1Y	-25.9	-37.8	-49.5	-14.7	-28.6	-15.5
1.5Y	-26.3	-39.9	-54.2	-15.9	-32.5	-18.1
2Y	-23.9	-38.4	-54.8	-16.3	-34.7	-19.8

Source: BoFA Global Research

BoFA GLOBAL RESEARCH

Exhibit 37: Bear Flattener (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	-22.6	-32.5	-39.9	-11.8	-21.8	-11.6
6M	-27.4	-40.1	-47.9	-15.1	-25.9	-13.0
1Y	-27.2	-41.1	-52.1	-16.3	-30.6	-16.7
1.5Y	-29.2	-44.6	-57.7	-18.3	-35.1	-19.6
2Y	-27.2	-43.5	-58.5	-18.8	-37.4	-21.6

Source: BoFA Global Research

BoFA GLOBAL RESEARCH

Exhibit 39: Bear Steepener (pickup to forwards for ATM)

Buy longer maturity payer, sell shorter maturity payer

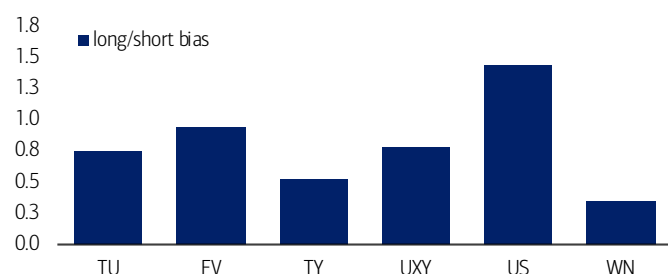
ATM	2/5s	2/10s	2/30s	5/10s	5/30s	10/30s
3M	22.6	32.5	39.9	11.8	21.8	11.6
6M	27.4	40.1	47.9	15.1	25.9	13.0
1Y	27.2	41.1	52.1	16.3	30.6	16.7
1.5Y	29.2	44.6	57.7	18.3	35.1	19.6
2Y	27.2	43.5	58.5	18.8	37.4	21.6

Source: BoFA Global Research

BoFA GLOBAL RESEARCH

Exhibit 41: Analysis of proxies for futures positioning

... shift to a long bias across the curve



Source: BoFA Global Research

BoFA GLOBAL RESEARCH

Exhibit 34: Bull Flattener (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	30.8	41.7	51.1	16.5	29.6	15.7
6M	35.1	47.9	57.9	18.8	32.1	15.9
1Y	31.3	45.4	58.7	17.9	34.3	18.3
1.5Y	30.8	46.2	62.2	18.7	37.2	20.6
2Y	27.1	43.3	61.2	18.7	39.0	22.0

Source: BoFA Global Research

BoFA GLOBAL RESEARCH

Exhibit 36: 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	-30.8	-41.7	-51.1	-16.5	-29.6	-15.7
6M	-35.1	-47.9	-57.9	-18.8	-32.1	-15.9
1Y	-31.3	-45.4	-58.7	-17.9	-34.3	-18.3
1.5Y	-30.8	-46.2	-62.2	-18.7	-37.2	-20.6
2Y	-27.1	-43.3	-61.2	-18.7	-39.0	-22.0

Source: BoFA Global Research

BoFA GLOBAL RESEARCH

Exhibit 38: Bear Flattener (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	-25.7	-37.6	-47.4	-13.8	-27.2	-15.7
6M	-30.4	-44.8	-55.2	-17.3	-31.3	-16.7
1Y	-29.2	-45.2	-58.9	-18.7	-36.4	-21.0
1.5Y	-31.5	-49.1	-64.9	-20.8	-41.3	-24.1
2Y	-30.0	-48.3	-66.3	-21.4	-43.7	-25.9

Source: BoFA Global Research

BoFA GLOBAL RESEARCH

Exhibit 40: Bear Steepener (pickup to forwards for +25bp OTM)

Buy longer maturity payer, sell shorter maturity payer

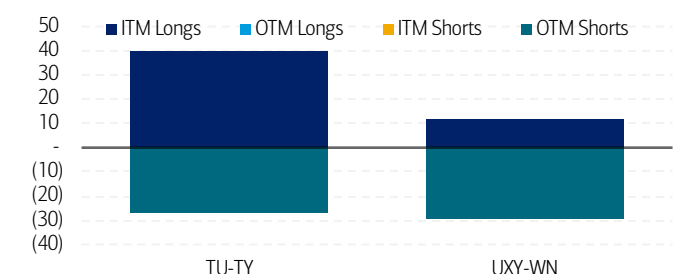
+25bp	2/5s	2/10s	2/30s	5/10s	5/30s	10/30s
3M	25.7	37.6	47.4	13.8	27.2	15.7
6M	30.4	44.8	55.2	17.3	31.3	16.7
1Y	29.2	45.2	58.9	18.7	36.4	21.0
1.5Y	31.5	49.1	64.9	20.8	41.3	24.1
2Y	30.0	48.3	66.3	21.4	43.7	25.9

Source: BoFA Global Research

BoFA GLOBAL RESEARCH

Exhibit 42: Proxies for futures positioning across the curve

Residual OTM shorts may continue to pressure rates lower



Source: BoFA Global Research

BoFA GLOBAL RESEARCH



Forward Volatility

Exhibit 43: 6m Forward Volatility

103.6bp for 6m fwd 1y10y

	1y	2y	5y	10y	30y
1m	192.1	165.6	133.4	109.2	89.9
3m	172.3	152.6	127.9	107.3	87.3
6m	147.0	139.0	120.7	102.9	83.6
1y	151.2	143.5	122.9	103.6	85.2
2y	135.9	135.9	117.1	98.9	82.0
5y	111.0	108.4	98.6	88.2	73.1
10y	84.3	81.9	78.5	73.4	63.2

Source: BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 44: 6m Fwd vol as % ATM

92% of ATM for 6m fwd 1y10y

	1y	2y	5y	10y	30y
1m	74%	73%	72%	74%	78%
3m	77%	71%	78%	80%	82%
6m	70%	73%	82%	85%	84%
1y	85%	88%	92%	92%	91%
2y	91%	95%	95%	92%	91%
5y	97%	98%	96%	95%	95%
10y	95%	95%	96%	96%	98%

Source: BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 45: 3m Z-Score 6m Fwd vol % ATM

-1.3 Z-Score for 6m fwd 1y10y

	1y	2y	5y	10y	30y
1m	-3.5	-2.4	-2.2	-2.5	-2.3
3m	-3.5	-3.7	-2.6	-2.7	-2.0
6m	-4.9	-4.2	-2.6	-2.3	-2.0
1y	-3.2	-2.2	-1.5	-1.3	-0.6
2y	-2.2	-1.8	-1.1	-1.4	-1.1
5y	0.4	1.2	0.1	-0.2	-0.2
10y	-1.0	-1.0	-0.2	0.6	0.7

Source: BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 46: 1y Forward Volatility

100.6bp for 1y fwd 1y10y

	1y	2y	5y	10y	30y
1m	126.2	120.7	114.3	97.7	82.1
3m	138.2	130.5	119.9	101.1	84.9
6m	135.1	130.1	120.0	101.1	84.9
1y	131.1	130.0	119.6	100.6	84.5
2y	128.3	131.5	114.8	95.8	79.5
5y	107.1	104.9	95.3	85.4	70.7
10y	81.7	79.5	76.7	71.8	61.5

Source: BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 47: 1y Fwd vol as % ATM

89% of ATM for 1y fwd 1y10y

	1y	2y	5y	10y	30y
1m	49%	54%	62%	66%	71%
3m	62%	61%	74%	76%	79%
6m	64%	68%	81%	84%	85%
1y	74%	80%	90%	89%	90%
2y	86%	92%	93%	89%	88%
5y	94%	94%	93%	92%	92%
10y	92%	92%	93%	94%	95%

Source: BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 48: 3m Z-Score 1y Fwd vol % ATM

-0.7 Z-Score for 1y fwd 1y10y

	1y	2y	5y	10y	30y
1m	-4.1	-3.1	-2.6	-2.8	-2.1
3m	-3.7	-3.4	-2.7	-2.7	-1.3
6m	-4.0	-3.3	-2.4	-1.9	-0.6
1y	-3.5	-2.4	-1.4	-0.7	0.5
2y	-2.3	-0.9	-0.1	-0.5	-0.3
5y	0.4	1.0	0.1	-0.1	0.0
10y	-1.0	-0.9	-0.1	0.8	0.6

Source: BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 49: 2y Forward Volatility

94.0bp for 2y fwd 1y10y

	1y	2y	5y	10y	30y
1m	91.0	104.9	109.8	89.3	71.8
3m	102.6	110.3	109.8	91.2	73.5
6m	112.3	113.7	111.8	92.6	74.4
1y	122.5	118.5	114.2	94.0	75.5
2y	114.8	121.6	110.2	90.7	72.2
5y	101.9	100.5	90.8	81.6	66.7
10y	78.6	76.0	74.2	69.0	58.9

Source: BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 50: 2y Fwd vol as % ATM

83% of ATM for 2y fwd 1y10y

	1y	2y	5y	10y	30y
1m	35%	47%	59%	60%	62%
3m	46%	52%	67%	68%	69%
6m	53%	60%	76%	77%	75%
1y	69%	73%	86%	83%	81%
2y	77%	85%	89%	84%	80%
5y	89%	91%	88%	88%	86%
10y	89%	88%	90%	91%	91%

Source: BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 51: 3m Z-Score 2y Fwd vol % ATM

0.1 Z-Score for 2y fwd 1y10y

	1y	2y	5y	10y	30y
1m	-3.7	-3.0	-2.5	-2.7	-2.2
3m	-3.8	-3.5	-2.8	-2.6	-1.7
6m	-4.2	-3.5	-2.6	-1.5	-0.9
1y	-4.0	-2.3	-0.4	0.1	0.1
2y	-1.9	-0.4	1.1	0.5	-0.3
5y	0.4	1.0	0.0	0.2	0.1
10y	-0.5	-0.7	0.2	0.6	0.4

Source: BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 52: 3y Forward Volatility

90.2bp for 3y fwd 1y10y

	1y	2y	5y	10y	30y
1m	81.2	89.3	105.6	90.5	69.0
3m	87.0	95.2	107.2	91.3	70.1
6m	97.8	101.2	108.0	91.1	70.1
1y	112.6	106.8	108.0	90.2	69.7
2y	103.0	112.9	105.1	88.5	69.6
5y	96.2	95.1	86.4	78.0	63.1
10y	75.9	73.4	72.2	67.3	56.9

Source: BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 53: 3y Fwd vol as % ATM

80% of ATM for 3y fwd 1y10y

	1y	2y	5y	10y	30y
1m	31%	40%	57%	61%	60%
3m	39%	44%	66%	68%	66%
6m	46%	53%	73%	75%	70%
1y	63%	65%	81%	80%	75%
2y	69%	79%	85%	82%	77%
5y	84%	86%	84%	84%	82%
10y	86%	85%	88%	88%	88%

Source: BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 54: 3m Z-Score 3y Fwd vol % ATM

0.5 Z-Score for 3y fwd 1y10y

	1y	2y	5y	10y	30y
1m	-3.4	-2.9	-2.5	-2.4	-1.9
3m	-3.4	-3.1	-2.4	-2.0	-1.3
6m	-3.5	-3.1	-1.8	-0.3	-0.6
1y	-3.1	-2.4	-0.3	0.5	-0.1
2y	-2.0	-0.6	0.9	0.9	-0.2
5y	-0.4	0.1	-0.4	-0.1	-0.2
10y	-0.3	-0.4	0.4	0.8	0.2

Source: BofA Global Research

BofA GLOBAL RESEARCH

Ratios implied/delivered

Exhibit 55: Implied vs. Delivered (21d) Ratio

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

	1y	2y	3y	5y	7y	10y	30y
1m	69%	76%	92%	99%	96%	101%	86%
3m	56%	67%	76%	82%	83%	87%	78%
6m	53%	66%	74%	77%	77%	79%	71%
1y	61%	73%	77%	76%	74%	73%	63%
2y	78%	79%	79%	74%	70%	69%	57%

Source: BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 56: Implied vs. Delivered (63d) Ratio

Ratios of Implied to 63d delivered >100% in gamma

	1y	2y	3y	5y	7y	10y	30y
1m	116%	119%	134%	135%	127%	130%	114%
3m	93%	103%	110%	111%	108%	113%	104%
6m	85%	97%	102%	101%	98%	101%	96%
1y	87%	94%	97%	94%	92%	93%	85%
2y	96%	98%	98%	93%	90%	90%	80%

Source: BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 57: 3m Z-Scores for Implied vs. Delivered (21d) Ratio

Ratios of implied/21d delivered cheap across the grid

	1y	2y	3y	5y	7y	10y	30y
1m	-1.7	-1.6	-0.9	-0.7	-0.9	-0.8	-1.6
3m	-1.9	-1.9	-1.6	-1.4	-1.5	-1.4	-2.0
6m	-1.9	-1.7	-1.6	-1.5	-1.7	-1.7	-2.1
1y	-1.5	-1.1	-1.1	-1.4	-1.6	-1.8	-2.2
2y	-0.9	-1.1	-1.2	-1.6	-1.9	-2.0	-2.2

Source: BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 58: 3m Z-Scores for Implied vs. Delivered (63d) Ratio

Ratios of implied/63d delivered rich across the grid

	1y	2y	3y	5y	7y	10y	30y
1m	0.6	0.7	1.3	1.2	1.1	1.2	0.9
3m	0.3	0.5	0.7	0.7	0.7	0.8	0.6
6m	0.3	0.5	0.6	0.5	0.4	0.5	0.4
1y	0.6	0.6	0.6	0.4	0.4	0.4	0.1
2y	0.6	0.6	0.6	0.4	0.3	0.3	0.0

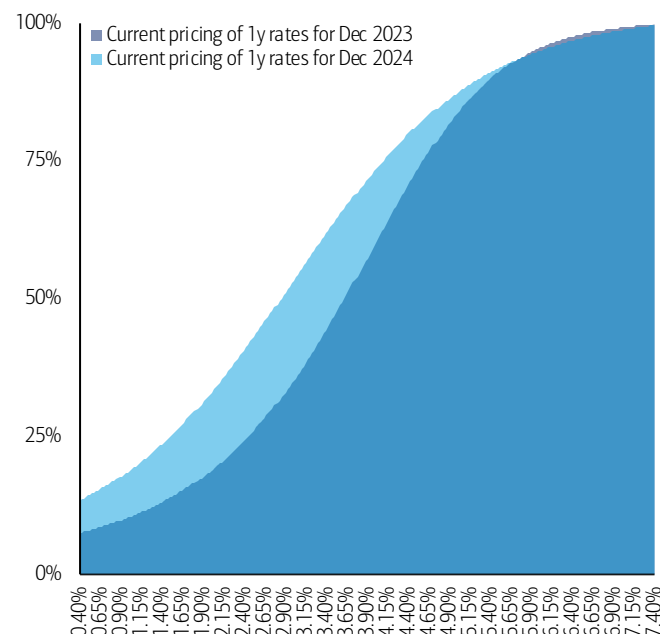
Source: BofA Global Research

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Rates probability distributions

Exhibit 59: CDF for 1y SOFR rates at end-2023 and end-2024

1y rate cumulative distribution functions

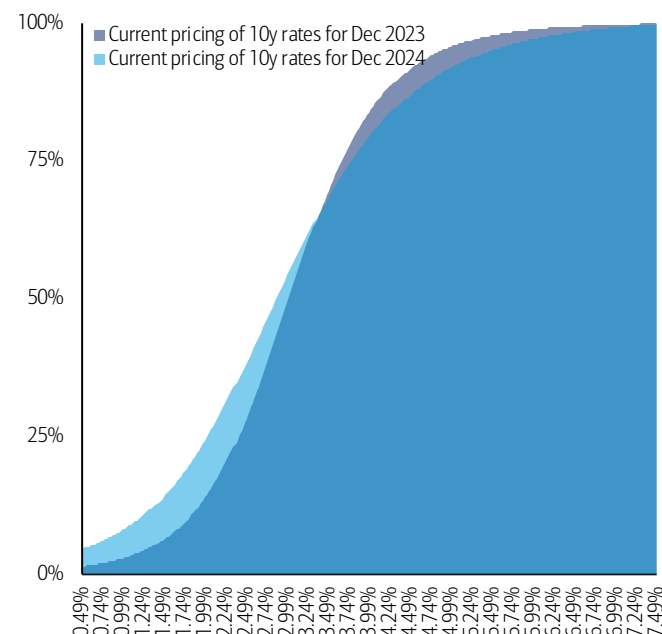


Source: BofA Global Research

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Exhibit 60: CDF for 10y SOFR rates at end-2023 and end-2024

10y rate cumulative distribution functions



Source: BofA Global Research

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Trade activity

Exhibit 61: 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	2550	453			480	2	48			3588
1m	2900	1370			300		2173	100	460	7733
3m	5740	3725		240	2594		4982	290	463	18557
6m	7228	1080	480	200	550	113	1191	86	340	16426
1y	19200	2518	538	37	465	22	1955	480	922	26137
2y	4310	1460	240	290	200	3	50	169	147	6869
3Y	900		14				1300			2214
4Y							25		30	55
5Y	250	100			270		681	25	644	1970
7Y								45	165	210
10Y		150					1326	325	275	2076
20Y										
30Y										
	43078	10856	1272	767	4859	140	13731	1520	3446	85835

Source: BofA Global Research; SDR, Bloomberg

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Exhibit 62: 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	1300	933			202	2	148		50	2690
1m	3360	450			300		2351	100	395	7966
3m	2900	4770			3528		3547	101	762	15881
6m	4560	720		200	550	100	940	50		12578
1y	13700	5225	480	500	637	22	1679	112	833	23188
2y	4310	2860	240	50	200		350	140	85	8235
3Y	900						1300			2200
4Y	150						25		30	205
5Y	250	100			270		681	25	631	1957
7Y								25	150	175
10Y		150					1666	415	195	2426
20Y										
30Y										
	31430	15208	720	750	5687	124	12687	968	3131	77501

Source: BofA Global Research; SDR, Bloomberg

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Exhibit 63: 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	900		115				320			2335
1m		240					290		60	590
3m					340		124			464
6m	250						112	70		432
1y	600					35			10	645
2y	200				40		100			340
3Y							120			120
4Y							120			120
5Y					300					300
7Y							75			75
10Y							300	200		500
20Y										
30Y										
	1950	240	115		680	35	1561	270	70	5921

Source: BofA Global Research; SDR, Bloomberg

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Formosa issuance

Exhibit 64: 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 65: 2023 Formosa issuance YTD (\$m)

Very limited issuance YTD

	2	5	7	10	15	20	25	30
1	33	14						
2				160				
3								
4				95				
5								
7								
10								
15								
20								
25								
30								

Source: BofA Global Research, Bloomberg

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Exhibit 66: Formosa issuance (\$m) since 2014

Peak issuance concentrated on the 5y30y tenor

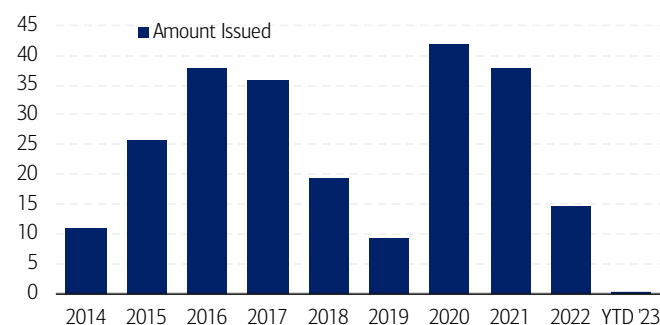
	2	5	7	10	15	20	25	30
1	33	219	75	1033	462	840		18054
2		40		954		1485		22177
3				110	20	240	225	15536
4		15		274	50	25	275	2441
5				20	445	1497	353	111658
7			30					5624
10				2000				4464
15								
20								
25								
30								5500

Source: BofA Global Research, Bloomberg

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Exhibit 67: Total issuance per year since 2014 (\$bn)

Very limited Formosa issuance YTD



Source: BofA Global Research, Bloomberg

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Notes

Exhibit 16: 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 17/19/21: 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 18/20/22: 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 27/28: 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 29/30: 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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