US Rates Viewpoint

US Vol – Data resilience and volatility

Drivers of economic resilience

The US economy continues to show resilience in the face of c.300bp of tightening vs the Fed's view for the neutral. Potential drivers for this resilience include: (1) policy lags, which suggest the impact of tightening is yet to peak; (2) an economy that may be transiently more resilient to policy tightening in the current cycle; and (3) a higher neutral rate, suggesting Fed officials may not be as restrictive as they think they are. Below we discuss risks and forward-looking expectations for these three drivers.

1. Policy lags

If policy lags are the main driver for the recent resilience, the macroeconomic backdrop may slow down materially over 4Q. By the end of the year probabilities may have tilted back toward slowdown scenarios, implying lower yields (<4% for 10yT), cuts priced back on the curve, and lower volatility with the left side of the grid leading the way.

2. A new hysteresis

An economy more resilient to tightening, on the other hand, implies higher-for-longer policy rates and potential further pricing out of cuts. It suggests steeper curves in bearish scenarios and support for volatility broadly as macro data dispersion stays elevated. On the grid, we should see higher steady state vol on the left side for a Fed on hold, but still a relatively flat grid between the left and the right side vs. current levels.

3. A higher neutral

The neutral may have repriced higher recently, by c.50bp, but forwards have outpaced this repricing. Macroeconomic data and the market may recouple back to soft landing scenarios over the next quarter in line with our economists' view. In this context, gravity from a c.3% neutral is likely to start to exert some downward pressure on belly forwards.

Policy trajectory vs dynamic of rates and vol

The market seems to assign relatively even or slightly higher probabilities to scenarios where cuts are further priced out from '24 vs scenarios where macroeconomic data recouples to soft landing and a lower neutral rate c.3% starts to exert some pressure over medium-term forwards. In our view, however, the probabilities should be more tilted towards the latter.

Positioning-wise…

We favor selling OTM payers in 10y tails to buy OTM receivers, receiver spreads in belly forwards, selling left side vol vs right side vol, and cap/caps spreads in 2s10s to hedge both: (1) scenarios of further resilience where the curve may bear steepen; and (2) position for the bull steepening that is associated with higher recession probabilities.

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Abbreviations:

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 – Global Financial Crisis
c. – circa (approximately)
CDF – Cumulative Distribution Function
PDF – Probability Density Function
BE – Inflation Breakevens

For a list of recent recommendations please see our Global Rates Weekly.

All levels as of September 8th.

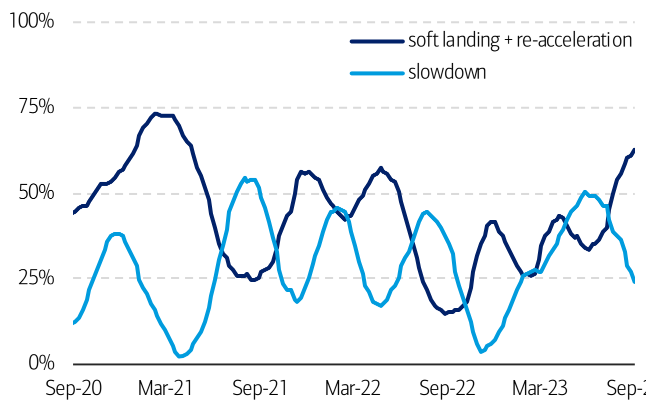
Economic resilience and the dynamic of rates & vol

The range of scenarios for the US economy over the next year can be reduced to four: hard landing; mild recession; soft landing; and re-acceleration (which may take a form similar to the mini-cycles over the last cycle).

The fact that the US economy continues to show resilience in the face of c.300bp of tightening vs the Fed's view for the neutral (c.2.5% if one uses the median of the Fed's longer run dots as a proxy) as tipped probabilities recently towards the right side of the range of outcomes (see Exhibit 1), supporting higher yields and volatility.

Exhibit 1: Increase in soft-landing/re-acceleration probability since early June

Soft landing/reacceleration odds c.63% vs. < 25% slowdown odds



Source: BofA Global Research

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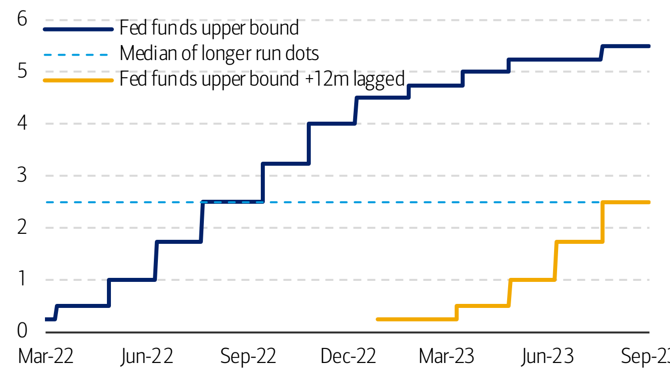
Exhibit 2: Degree of tightening that may not be fully reflected in the economy if policy response functions operate with a 12m lag

Full impact of the set of 75bp hikes in '22 felt only over the 4Q23



Source: BofA Global Research; Bloomberg

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To understand the likely evolution of these expectations, however, it is important to explore the drivers for this resilience. We look briefly here at three potential drivers for this resilience, with different implications for the dynamic of rates and volatility: (1) policy lags, which suggest the impact of tightening is yet to peak; (2) an economy is transiently more resilient to policy tightening in the current cycle; and (3) a higher neutral rate for the US economy, which implies that Fed officials may not be as restrictive as they think they are.

Policy lags

The last two 75bp rate hikes of the current tightening cycle were delivered on the 21st of Sep and the 2nd of Nov 2022. These finally took the upper bound of the policy rate from neutral to restrictive territory (the upper bound moved from 2.5% by early Sep '22 to c.4% by early Nov '22, versus 2.5% neutral rate expectations).

The impulse response function of economic models to policy tightening seem to peak at a c.12m horizon. Only over the next quarter therefore will the economy feel the full impact of this sharp transition into restrictive territory (Exhibit 2 represents in a simple form the degree of tightening that may be fully reflected in the economy at this point if policy response functions operate with a 12m lag).

It is not surprising therefore that the Fed continues to refer to policy lags in its recent communication. For example, in the July meeting statement: *"In determining the extent of additional policy firming that may be appropriate to return inflation to 2 percent over time, the Committee will take into account the cumulative tightening of monetary policy, the lags with which monetary policy affects economic activity and inflation, and economic and financial developments."*

Bottom line: If policy lags are the main driver for the recent resilience, the macro backdrop may slow down materially over 4Q. By the end of the year probabilities may have tilted back towards slowdown scenarios, implying lower yields (<4% for 10yT), cuts priced back on the curve, and lower volatility with the left side of the grid leading the way.

A new hysteresis

Fed Chair Yellen introduced the concept of hysteresis to the finance jargon when she argued that deep recessions create persistent distortions (shortfalls in the post-GFC period) in aggregate demand that affect the supply side of the economy[1]. The prescription post-GFC was to run policy more accommodative for longer.

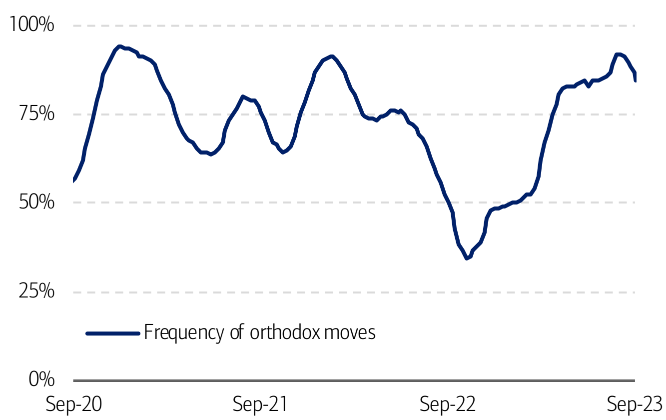
The COVID crisis has created significant distortions in the economy, e.g., in the labor market with indications of hoarding of labor given how difficult it is to hire and retain talent, or in the housing market with supply constrains as homeowners refinanced their mortgages at historically low levels.

In macroeconomic data, one of the visible echoes of these distortions has been the decoupling of growth and inflation fundamentals. The market expectation going into '23 was for these to recouple on the downside. The recent dynamic of breakevens indeed reflects an increase in frequency for the orthodox moves of the BE dynamic (bear widening and bull tightening – see Exhibit 3) and suggests expectations for a recoupling of growth and inflation fundamentals ahead. The recent economic resilience against a backdrop of gradually lower inflation either: (1) pushes back against these expectations; or (2) highlights the risks associated to re-acceleration scenarios.

In the former, post-COVID distortions continue to create transient friction in monetary policy transmission. In this post-COVID sort of hysteresis, it may be necessary to run policy tighter for longer to rebalance the supply and demand sides of the economy.

Bottom line: Higher for longer policy rates and a potential further pricing out of cuts suggests steeper curves in bearish scenarios and support for volatility broadly as macro data dispersion is likely to stay elevated. On the grid, we should see higher steady state vol on the left side for a Fed on hold, but still a relatively flat grid between the left and the right side vs current levels (see Exhibit 15).

Exhibit 3: Frequency of orthodox moves in the dynamic of 10y BEs
Bull tightening + bear widening frequencies (these are the moves that reflect positive correlations between growth and inflation)



Source: BofA Global Research

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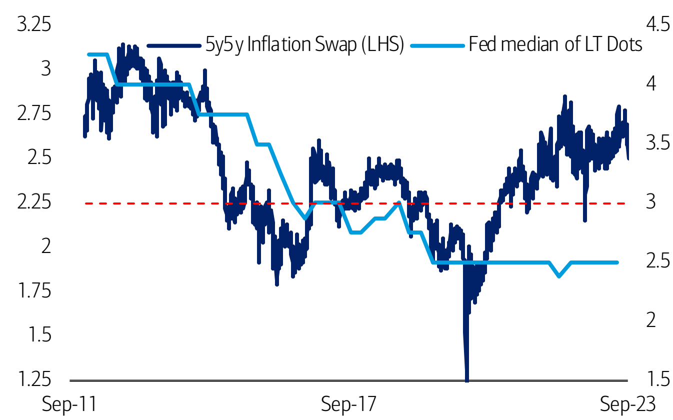
Exhibit 4: Median of the Longer run dots and 5y5y inflation
Median of the longer run Fed dots (proxy for the Fed's view of the neutral) has decoupled from longer term inflation expectations recently



Source: BofA Global Research; Bloomberg

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Neutral repricing

Expectations for slightly higher potential growth (from friend-shoring and on-shoring momentum) and higher longer-term inflation expectations (see Exhibit 4) suggest upward pressure on the neutral rate view for the US economy. Our analysis of the curve dynamic (both for the bear-flattening dynamic in the recent tightening and for the bull

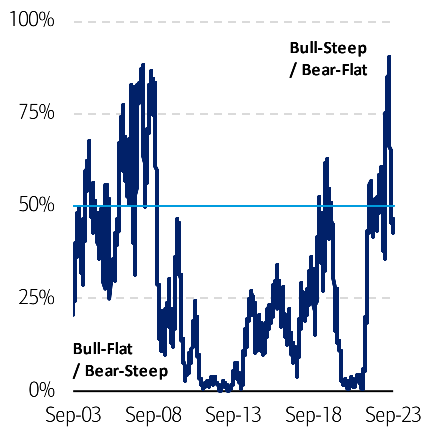
[1] Speech by Chair Yellen on macroeconomic research after the crisis - Federal Reserve Board

steepening dynamic priced into the curve forwards – see The curve dynamic & the neutral rate) indicates a potential c.50bp repricing of neutral to c.2.75-3%.

A higher degree of freedom at the front end of the US curve is a natural implication of this higher neutral. Indeed, our index for the 2s10s directionality seems to suggest some level of mean reversion to the pre-GFC regime (see Exhibit 5). For the vol grid, this higher degree of freedom offsets some of the downward pressure from a Fed shift to on-hold, and explains why the left side has been so sticky even as the market prices an end to tightening near-term and rate cuts at a 7-9m horizon (see Exhibit 6).

Exhibit 5: 2s10s directionality index

2s10s showing higher degree of freedom vs the last cycle (potentially back to the pre-GFC regime)



Source: BofA Global Research

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Exhibit 6: Timing of the first Fed rate cut

First rate cut (y-axis in months) fully priced an 8m horizon (c.2Q24)

Source: BofA Global Research

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Exhibit 7: Recent dynamic of 3y1y OIS

Proxy for neutral rate expectations late in the tightening cycle

Source: BofA Global Research; Bloomberg

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In line with the view above, 3y1y OIS forward levels, which can be thought of as a proxy for the market view for the neutral in a tightening cycle, converged relatively quickly to the 2.5-3% range by 2Q22 (see Exhibit 7). Medium-term forwards tend to converge to agnostic levels (i.e., levels close to the neutral) as the Fed starts to tighten policy, while shorter-term forwards catch up to intermediate forwards as the Fed delivers on tightening expectations.

Significantly, in recent periods when probabilities of re-acceleration scenarios have spiked (see Exhibit 1), as in October '22 or over the summer, 3y1y OIS reached levels c.3.75%. To some extent, however, those levels are expected to reflect some decoupling from the neutral, which is natural in a re-acceleration process.

Bottom line: We expect macroeconomic data and the market to recouple back to soft landing scenarios over the next quarter in line with our economists' view. In this context, gravity from a neutral around 3% is likely to start to exert some downward pressure on belly forwards. The 5s30s curve may see some bull steepening pressure in this context, and volatility should drift lower.

However, higher neutral rate expectations imply a Fed that is not as restrictive as it expects to be. If lags fail to unfold, the economy stays resilient and/or probabilities start to tilt more significantly towards reacceleration, the potential for further Fed tightening increases. These scenarios imply further bear-flattening momentum on the curve and support volatility across the grid. We don't see these re-acceleration scenarios as core, but rather a tail risk that should be hedged in portfolios.

Policy trajectory vs dynamic of rates and vol

The expected evolution of the three drivers of US resilience discussed above (policy lags, economic friction to tightening, and an upward repricing of the neutral) define different expectations for the policy trajectory (particularly for the cuts priced on the curve for '24 and '25), and therefore different scenarios for the dynamic of rates and volatility going forward.

The market is currently pricing c.100bp of cuts in '24 and 75-100bp of cuts in '25. We shock these expectations instantaneously to understand the potential impact of different scenarios on yields, curve, and volatility. We apply two types of shocks: (1) a persistent shock that is more likely to correspond to repricing of neutral rate expectations higher/lower; and (2) a frontloading/backloading of cuts (more cuts priced into '24 at the expense of '25, or vice versa), which is more likely to be driven by repricing of policy lags or economic friction to policy tightening.

In bearish higher-for-longer scenarios or scenarios of further upward repricing of the neutral rate view:

- Higher for longer policy rates (as lags take longer to unfold) the market prices out hikes in '24 further (+50bp in scenarios #2 and #3, or more extreme +100bp in scenarios #5 and #6 – see Exhibit 8), but potentially add cuts to '25. These scenarios imply a bearish impulse for rates of up to c.50bp in 10yT (to c.4.75%) but limited steepening pressure on the curve;

- Higher neutral expectations, on the other hand, are likely to imply a more persistent shock to policy rates (+50bp in scenario #1 or #2 or a rather extreme +100bp in scenarios #4 and #5 – see Exhibit 8). They imply up to 90bp of bearish impulse in 10yT (to c.5.15%), with up to c.35bp of steepening pressure on the 2s10s curve.

In terms of relative likelihood, we find the former more likely than the latter (higher for longer more likely than a further structural repricing of the neutral rate higher from here) – we favor scenario #2 in Exhibit 8 as a most likely tail on the bearish side. One should therefore expect limited potential further steepening pressure ahead. Both these types of shocks are likely to keep vol supported, with the latter offering more support for the left side of the grid than the former.

Exhibit 8: Bearish repricing of the policy trajectory (changes to 2y and 10yY yields in bps)

Higher-for-longer policy or upward repricing of neutral rate

Scenario	#1	#2	#3	#4	#5	#6
2024	+50	+50	+50	+100	+100	+100
2025		-25	-50		-50	-100
2y	26	24	21	54	49	45
10y	45	25	5	91	51	11
2s10s	19	2	-16	37	2	-33

Source: BofA Global Research

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Exhibit 9: Bullish repricing of the policy trajectory (changes to 2y and 10yY yields in bps)

Recoupling to soft landing or faster than expected unfolding of policy lags

Scenario	#1	#2	#3	#4	#6	#7
2024	-50	-50	-50	-100	-100	-100
2025		-25	+50		-50	+100
2y	-30	-32	-26	-58	-63	-49
10y	-46	-66	-6	-92	-133	-12
2s10s	-16	-34	19	-34	-70	37

Source: BofA Global Research

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In bullish scenarios where lags start to unfold, or macroeconomic data recouples back to soft landing expectations and decreases probabilities of re-acceleration:

- Baseline scenarios when the market prices the neutral back to levels c.3% drive c.45bp of pressure in 10yT (scenario #1 – see Exhibit 9) but may drive a flattening in 2s10s of up to c.15bp;

- In softer landing or mild recession scenarios (as lags unfold) the market adds to cuts across '24 and '25 (scenarios #2 and #6 – see Exhibit 9). In these scenarios the 10yT leads the outperformance on the curve (scenario #2 in Exhibit 9 corresponds to a c.75bp move in 3y1y rates back to the 2.75-3% range).

Bullish scenarios generally imply outperformance of the belly and lower volatility across the grid – we favor #2 in Exhibit 9 as the most likely tail on the bullish side (with 3y1y back to 2.75-3% as lags unfold). We show scenarios #3 and #7 in Exhibit 9 to illustrate that to realize a bull steepening in 2s10s the market needs to fade the cuts that are added near term at a longer horizon (presumably beyond '25, i.e., cuts beyond the neutral near-term and a return to neutral medium term). Bull steepening is likely in 5s30s in these scenarios before it extends to 2s10s.

Positioning wise

The market seems to assign relatively even or slightly higher probabilities to scenario #2 in Exhibit 8 relative to scenario #2 in Exhibit 9 (this is suggested by the probabilities that seem to be assigned to re-acceleration scenarios – see Exhibit 1 – and the relative valuations of payer vs receiver skew – see Exhibit 32). In our view, however, probabilities should be more tilted toward the latter, which suggests selling 28bp (indicative) out-of-the-money payers in 10y tails to buy 25bp out-of-the-money receivers, with expiries around 6m (optimal expiries are in the 6-12m range, in our view). The risk on these positions are scenarios of further reacceleration, with potentially unlimited downside.

Our view for the potential for lags to unfold with a higher momentum over 4Q also supports long receiver spreads in 3y1y forwards (see Soft-landing scenarios and vol, currently +2bp). The recoupling back to soft landing scenarios allows the neutral to start to exert a pull over these belly forwards, and we may see an outperformance of the belly in these scenarios.

We continue to like selling vol on the left side of the grid vs the right side. Vol carry is positive on the position (the term structure of volatility is steep on the left side of the grid but relatively flat on the right side – see Exhibit 10). However, we like to be conservative on the targets for these positions. A higher degree of freedom of the front end of the curve implied by a higher neutral rate offsets some of the downward pressure from an on-hold Fed (near-term 1y1y vs 1y10y seems fair at spreads c.20bp vs current values c.34bp – see Rates roadmap for a Fed on hold).

On the curve, we continue to like to position for a steepening bias through 2s10s curve caps/cap spreads (see 2s10s curve steepeners). These positions serve as hedges for scenarios of further resilience when the curve may bear-steepen further, but also perform well in the bull steepening that generally accompanies higher recession probabilities.

Levels and Recent Moves

Exhibit 10: ATM Normal Volatility Grid
112bp for 1y10y volatility on Friday's close

	1Y	2Y	3Y	5Y	7Y	10Y	30Y
1M	77	116	113	117	110	105	88
3M	101	130	126	122	117	112	95
6M	124	138	132	126	120	113	97
1Y	146	144	139	127	119	112	97
2Y	142	137	131	122	115	108	93
3Y	133	128	124	116	110	103	89
4Y	124	120	117	111	106	99	85
5Y	117	113	110	105	100	95	82
10Y	92	90	88	85	82	79	69
30Y	65	64	63	60	58	55	50

Source: BofA Global Research

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Exhibit 11: ATM Volatility Grid – 3m Z-Scores
Grid broadly rich on 3m Z-Scores except for the ULC & gamma

	1Y	2Y	3Y	5Y	7Y	10Y	30Y
1M	-1.3	-1.4	-1.7	-1.5	-1.0	-0.3	0.0
3M	-0.9	-1.0	-1.3	-1.5	-0.7	0.1	0.4
6M	-0.9	-0.9	-1.2	-0.8	-0.1	0.3	0.7
1Y	-0.7	-0.2	0.2	0.3	0.5	0.6	1.0
2Y	0.9	0.9	0.7	0.7	0.7	0.7	1.0
3Y	1.2	1.1	1.1	1.0	0.9	0.8	1.1
4Y	1.0	1.0	1.0	1.1	1.0	0.9	1.1
5Y	1.0	1.0	1.0	0.9	0.9	0.9	1.1
10Y	1.1	1.1	1.1	1.1	1.1	1.1	1.2
30Y	1.3	1.3	1.3	1.3	1.3	1.3	1.3

Source: R BofA Global Research

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Exhibit 12: ATM Normal Volatility Grid – CoW
Outperformance broadly left/right parallel over the last week

	1Y	2Y	3Y	5Y	7Y	10Y	30Y
1M	-5.0	-0.7	-0.3	0.1	0.1	0.1	-2.0
3M	0.6	3.4	2.0	0.7	0.7	0.6	1.4
6M	-0.3	3.3	2.6	1.9	1.8	1.7	2.5
1Y	1.0	4.0	3.7	3.4	3.2	3.0	4.0
2Y	3.9	3.7	3.4	3.1	2.6	2.0	2.2
3Y	3.1	2.9	2.8	2.5	2.2	1.8	2.2
4Y	2.3	2.2	2.2	2.0	1.9	1.6	1.9
5Y	2.2	2.1	2.1	2.0	1.8	1.6	1.6
10Y	1.2	1.1	1.1	1.1	1.0	1.0	0.9
30Y	0.5	0.5	0.5	0.5	0.5	0.4	0.4

Source: BofA Global Research

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Exhibit 13: ATM Straddle Premiums (indicative only)
7.0% straddle premiums for 1y10y

	1Y	2Y	3Y	5Y	7Y	10Y	30Y
1M	0.2%	0.5%	0.7%	1.2%	1.5%	2.0%	3.6%
3M	0.4%	1.0%	1.4%	2.2%	2.8%	3.6%	6.8%
6M	0.7%	1.4%	2.0%	3.1%	4.0%	5.1%	9.7%
1Y	1.1%	2.1%	2.9%	4.3%	5.5%	7.0%	13.5%
2Y	1.4%	2.7%	3.8%	5.7%	7.2%	9.1%	17.7%
3Y	1.6%	3.0%	4.2%	6.4%	8.2%	10.3%	20.0%
4Y	1.6%	3.1%	4.4%	6.7%	8.7%	11.0%	21.4%
5Y	1.6%	3.1%	4.5%	6.9%	8.9%	11.4%	22.3%
10Y	1.5%	2.9%	4.2%	6.5%	8.5%	11.1%	22.7%
30Y	1.0%	1.9%	2.8%	4.3%	5.7%	7.6%	18.3%

Source: BofA Global Research

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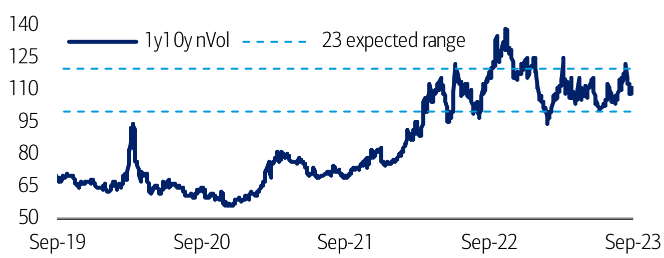
Exhibit 14: 1y10y vol dynamic since the COVID recession
1y10y c.112 vs. c.110 mid-point of the 100-120bp expected range for 2023



Source: BofA Global Research; Bloomberg

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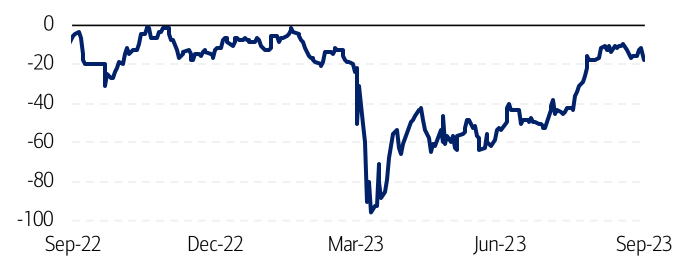
Exhibit 15: 3m10y vs. 3m2y normal volatility
Left side still trades rich vs right side even as market prices last hike



Source: BofA Global Research; Bloomberg

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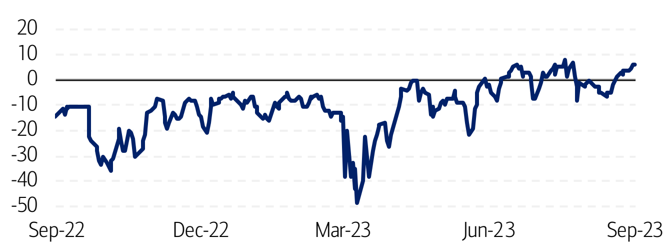
Exhibit 16: 1y10y vs. 1m10y normal volatility
Vol term structure steepened back over the last week



Source: BofA Global Research; Bloomberg

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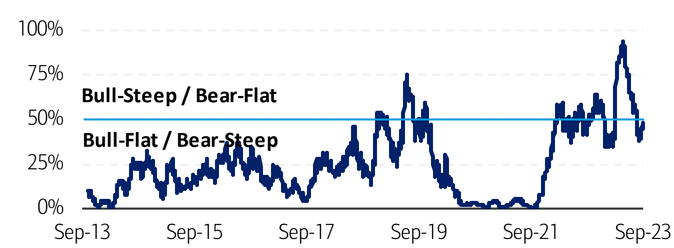
Exhibit 17: 2s10s curve directionality only 47% frontend driven
Frontend faded as a driver for the curve dynamic recently



Source: BofA Global Research

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Volatility Grid Relative Value

PCA Z-SCORES

Exhibit 18: 3m Z-Scores w/ PCA framework
Short gamma in belly cheap, elsewhere grid fair to rich on 3m Z-Scores

	1y	2y	3y	5y	7y	10y	30y
3m	1.0	1.0	-1.0	-2.4	-2.5	-1.7	-0.6
6m	0.5	1.0	-1.0	-1.8	-1.9	-1.5	-0.3
1y	0.4	0.4	0.8	0.3	0.4	-0.5	1.0
2y	1.6	1.0	0.9	0.5	0.4	0.0	1.2
5y	2.3	1.8	2.1	1.4	1.6	1.6	1.4
10y	2.2	2.2	2.2	2.1	2.1	2.0	1.8

Source: BofA Global Research

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Exhibit 19: 3m Z-Scores w/ PCA framework w/o rates directionality
Belly & right cheap when directionality is considered

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

Source: BofA Global Research

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Exhibit 20: 6m Z-Scores w/ PCA framework
Gamma cheap in belly/right, richness elsewhere on 6m Z-Scores

	1y	2y	3y	5y	7y	10y	30y
3m	1.4	1.0	-1.0	-2.6	-2.2	-1.4	-1.3
6m	0.3	0.8	-1.2	-1.7	-1.7	-1.5	-0.6
1y	0.4	0.9	1.3	0.5	-0.5	-0.6	1.2
2y	2.2	1.5	1.4	0.2	0.2	0.1	1.9
5y	1.3	1.3	1.3	1.2	1.2	1.0	1.8
10y	1.7	2.1	2.1	2.0	1.8	1.7	2.2

Source: BofA Global Research

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Exhibit 21: 6m Z-Scores w/ PCA framework w/o rates directionality
Belly cheap when directionality is considered

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

Source: BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 22: 1y Z-Scores w/ PCA framework
Gamma cheap in belly/right, richness elsewhere on 1y Z-Scores

	1y	2y	3y	5y	7y	10y	30y
3m	-0.3	0.7	-0.9	-2.8	-2.8	-2.1	-1.4
6m	2.2	-0.5	-0.3	-1.1	-2.3	-2.4	-0.6
1y	0.4	0.4	0.0	0.7	0.3	-0.9	1.0
2y	2.2	2.1	1.7	1.4	1.4	0.8	2.3
5y	2.4	2.6	2.4	2.3	2.4	2.1	2.7
10y	2.4	2.7	2.7	2.6	2.7	2.5	2.8

Source: BofA Global Research

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Exhibit 23: 1y Z-Scores w/ PCA framework w/o rates directionality
Grid broadly cheap when directionality is considered

	1y	2y	3y	5y	7y	10y	30y
3m	-0.8	-0.6	-0.9	-1.5	-1.6	-1.4	-1.2
6m	-0.5	-0.7	-0.8	-1.2	-1.2	-1.2	-0.9
1y	-0.5	-0.7	-0.8	-0.7	-0.8	-0.9	-0.5
2y	-0.1	-0.3	-0.5	-0.6	-0.6	-0.7	-0.2
5y	-0.3	-0.2	-0.2	-0.3	-0.2	-0.2	0.6
10y	0.1	0.3	0.3	0.3	0.4	0.3	1.6

Source: BofA Global Research

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Exhibit 24: 3m Z-Scores w/ modified PCA framework ...
Grid broadly fair to cheap with focus of richness in given tenors

	1y	2y	3y	5y	7y	10y	30y
1m	0.4	-0.5	-1.1	-0.2	-0.3	-1.8	-1.1
3m	-0.6	-3.3	-1.5	-0.5	-0.7	-0.6	1.8
6m	-0.8	-1.2	-0.3	-1.2	-1.6	-0.5	-0.2
1y	-0.3	-0.8	1.6	-0.3	-0.9	0.1	-0.1
2y	0.3	0.1	0.0	-0.2	0.7	-1.2	0.1
3y	0.6	1.1	0.3	-0.2	-0.2	-0.1	-2.1
4y	-0.4	1.5	0.5	-0.7	1.9	-1.5	-0.4
5y	0.5	-2.6	-0.2	-0.7	0.5	0.2	-0.2
10y	2.3	-0.7	-0.3	1.1	-1.2	0.3	-0.5
15y	1.1	-0.1	1.8	-1.1	0.3	0.8	-0.9
30y	1.5	1.9	0.6	-0.3	-0.4	-1.9	1.9

Source: BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 25: ... and w/o directionality with rates
Grid broadly fair to cheap with focus of richness in given tenors

	1y	2y	3y	5y	7y	10y	30y
1m	0.0	-1.0	-1.2	-0.1	-0.3	-1.0	-1.1
3m	-1.2	-2.9	-1.4	-0.8	-0.8	-0.6	1.7
6m	-0.9	-1.0	-0.3	-1.4	-1.5	-0.7	-0.4
1y	-0.5	-0.7	1.7	-0.5	-1.2	0.2	0.0
2y	0.4	0.0	0.1	-0.1	0.6	-1.4	0.3
3y	0.6	1.2	1.1	-0.2	-0.6	-0.5	-2.2
4y	-0.7	1.1	0.6	-0.7	1.8	-0.2	-0.5
5y	0.3	-2.2	-0.3	-0.3	0.4	0.1	-0.2
10y	2.3	-0.1	-0.5	1.1	-1.1	0.1	-0.7
15y	0.5	0.1	2.1	-1.5	-0.8	1.2	-0.9
30y	1.5	1.9	0.7	-1.3	-0.8	-1.9	1.4

Source: BofA Global Research

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Skew Relative Value

Exhibit 26: Skew 25% delta
Receivers rich on intermediates on the left on 3m Z-Scores

	1Y	2Y	3Y	5Y	7Y	10Y	30Y
1M	6.3	7.3	5.2	1.0	-0.4	-1.1	-1.5
3M	12.1	12.1	8.8	2.7	0.7	-0.7	-1.5
6M	15.9	13.8	10.1	3.3	1.0	-0.8	-1.7
1Y	13.8	10.4	7.1	1.1	-1.2	-2.5	-2.1
2Y	0.6	-0.3	-0.9	-3.0	-3.7	-4.3	-2.6
5Y	-8.3	-7.4	-6.4	-6.1	-5.5	-5.3	-2.8
10Y	-6.1	-5.5	-5.0	-4.9	-4.7	-4.8	-3.0
30Y	-1.4	-1.1	-0.6	-0.8	-1.4	-1.6	-1.1

Source: BofA Global Research

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Exhibit 27: Skew 75% delta
Payers Cheap on intermediates on the left and ULC

	1Y	2Y	3Y	5Y	7Y	10Y	30Y
1M	-6.2	-7.1	-4.5	0.1	1.6	2.3	2.6
3M	-10.4	-9.2	-4.9	1.8	3.7	4.7	5.0
6M	-12.3	-8.5	-3.7	3.5	5.4	6.8	6.7
1Y	-7.9	-3.5	0.4	6.1	7.8	8.5	7.4
2Y	5.8	6.8	7.6	9.1	9.3	9.8	7.3
5Y	15.4	14.8	14.2	13.7	12.7	12.4	8.6
10Y	15.4	14.9	14.7	14.3	13.9	13.4	8.7
30Y	14.2	14.0	13.8	13.5	12.4	12.0	8.5

Source: BofA Global Research

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Exhibit 28: Breakeven Widths for Costless Receiver Ladders
108bp breakeven width for 1y10y receiver ladders

	1Y	2Y	3Y	5Y	7Y	10Y	30Y
1M	27	39	37	35	32	31	25
3M	65	79	73	65	60	56	47
6M	115	121	109	94	87	80	67
1Y	179	166	153	130	118	108	95
2Y	204	195	185	167	154	143	126
5Y	233	228	224	212	205	194	173
10Y	258	255	251	240	233	222	201

Source: BofA Global Research

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Exhibit 29: Breakeven Widths for Costless Payer Ladders
131bp breakeven width for 1y10y payer ladders

	1Y	2Y	3Y	5Y	7Y	10Y	30Y
1M	20	31	31	35	33	32	28
3M	43	59	60	64	63	62	53
6M	75	89	90	95	93	91	80
1Y	135	139	140	140	137	131	113
2Y	218	214	208	201	192	183	156
5Y	346	335	325	310	295	281	227
10Y	423	413	406	392	380	366	284

Source: BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 30: 3m Z-Score Receiver Skew (w/o fwds & ATM direction)
Receiver skew fair to rich, rich particularly on intermediates on left

	1Y	2Y	3Y	5Y	7Y	10Y	30Y
1M	-0.1	0.1	0.4	0.6	0.4	0.2	-0.3
3M	-1.0	-1.4	0.0	1.5	1.1	0.6	0.5
6M	-0.7	-0.5	0.3	0.8	0.9	1.1	0.1
1Y	1.3	1.2	0.1	0.9	0.8	0.2	0.3
2Y	2.5	2.4	2.2	2.1	1.5	0.9	-0.5
5Y	1.4	1.5	0.7	0.4	0.8	-0.5	-0.4
10Y	-0.2	-0.2	-0.2	-0.3	-0.4	-0.6	-0.5

Source: BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 31: 3m Z-Score Payer Skew (w/o direction w/ fwds & ATM)
Payer skew cheap broadly, particularly intermediates in left/belly

	1Y	2Y	3Y	5Y	7Y	10Y	30Y
1M	-0.2	0.0	0.2	-0.1	-0.2	-0.2	-0.2
3M	0.2	0.3	1.0	-1.3	-1.3	-1.2	-0.8
6M	0.1	-0.1	-0.4	-1.3	-1.2	-1.3	-0.4
1Y	-0.1	-0.7	0.0	-0.8	-0.9	-1.2	0.9
2Y	-2.4	-2.3	-2.1	-2.0	-1.6	-1.4	0.3
5Y	-1.5	-1.5	-0.8	-0.5	-1.1	-2.7	0.7
10Y	0.4	0.5	0.5	0.6	0.6	0.5	0.4

Source: BofA Global Research

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Exhibit 32: Ratio of Payer/Receiver BE widths for Costless Ladders
Ratios of breakeven widths > 100% except on the ULC

	1Y	2Y	3Y	5Y	7Y	10Y	30Y
1M	74%	79%	85%	97%	104%	106%	110%
3M	67%	75%	82%	99%	105%	110%	113%
6M	66%	74%	82%	101%	107%	113%	119%
1Y	76%	84%	91%	108%	116%	122%	120%
2Y	107%	110%	113%	120%	125%	128%	124%
5Y	149%	147%	145%	146%	144%	145%	131%
10Y	164%	162%	162%	163%	163%	165%	141%

Source: BofA Global Research

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Exhibit 33: 3m Z-Score Ratio of Payer/Receiver Skew
Cheap payer vs receiver skew at intermediates on the left side and belly

	1Y	2Y	3Y	5Y	7Y	10Y	30Y
1M	1.1	0.7	1.3	0.0	1.0	0.4	1.1
3M	1.5	1.8	1.7	0.6	0.4	0.5	0.7
6M	0.8	0.7	1.1	0.9	0.8	0.3	1.1
1Y	-1.3	-0.7	0.2	0.5	0.7	0.7	1.0
2Y	-2.5	-2.6	-2.6	-1.7	-0.2	0.3	1.4
5Y	-1.9	-1.9	-1.1	-0.8	-0.9	1.5	1.4
10Y	1.2	1.1	1.2	1.3	1.5	1.5	1.4

Source: BofA Global Research

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Conditional Curve Trades

Exhibit 34: 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	3.0	6.5	12.0	3.8	9.5	6.2
6M	6.3	12.6	19.4	6.9	15.6	15.6
1Y	15.6	15.6	15.6	15.6	15.6	15.6
1.5Y	15.6	15.6	15.6	15.6	15.6	15.6
2Y	15.6	15.6	15.6	15.6	15.6	15.6

Source: BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 35: 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	15.6	15.6	15.6	15.6	15.6	15.6
6M	15.6	15.6	15.6	15.6	15.6	15.6
1Y	15.6	15.6	15.6	15.6	15.6	15.6
1.5Y	15.6	15.6	15.6	15.6	15.6	15.6
2Y	15.6	15.6	15.6	15.6	15.6	-75.1

Source: BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 36: 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	-3.0	-6.5	-12.0	-3.8	-9.5	-6.2
6M	-6.3	-12.6	-19.4	-6.9	-15.6	-15.6
1Y	-15.6	-15.6	-15.6	-15.6	-15.6	-15.6
1.5Y	-15.6	-15.6	-15.6	-15.6	-15.6	-15.6
2Y	-15.6	-15.6	-15.6	-15.6	-15.6	-15.6

Source: BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 37: 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	-15.6	-15.6	-15.6	-15.6	-15.6	-15.6
6M	-15.6	-15.6	-15.6	-15.6	-15.6	-15.6
1Y	-15.6	-15.6	-15.6	-15.6	-15.6	-15.6
1.5Y	-15.6	-15.6	-15.6	-15.6	-15.6	-15.6
2Y	-15.6	-15.6	-15.6	-15.6	-15.6	75.1

Source: BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 38: 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	-3.0	-6.9	-12.8	-4.0	-10.3	-6.5
6M	-6.3	-13.6	-21.2	-7.5	-15.5	-8.9
1Y	-13.2	-24.7	-34.1	-12.4	-22.9	-11.8
1.5Y	-16.1	-29.6	-40.9	-14.6	-27.4	-14.6
2Y	-17.3	-32.3	-45.2	-16.3	-31.0	-16.7

Source: BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 39: 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	-0.9	-5.4	-14.0	-4.6	-13.2	-9.3
6M	-5.0	-13.2	-23.1	-8.3	-18.8	-11.4
1Y	-13.0	-26.1	-37.8	-13.8	-26.9	-14.6
1.5Y	-16.7	-31.9	-45.6	-16.5	-31.9	-17.5
2Y	-18.7	-35.4	-50.9	-18.1	-35.6	-19.8

Source: BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 40: 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	3.0	6.9	12.8	4.0	10.3	6.5
6M	6.3	13.6	21.2	7.5	15.5	8.9
1Y	13.2	24.7	34.1	12.4	22.9	11.8
1.5Y	16.1	29.6	40.9	14.6	27.4	14.6
2Y	17.3	32.3	45.2	16.3	31.0	16.7

Source: BofA Global Research

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Exhibit 41: 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	0.9	5.4	14.0	4.6	13.2	9.3
6M	5.0	13.2	23.1	8.3	18.8	11.4
1Y	13.0	26.1	37.8	13.8	26.9	14.6
1.5Y	16.7	31.9	45.6	16.5	31.9	17.5
2Y	18.7	35.4	50.9	18.1	35.6	19.8

Source: BofA Global Research

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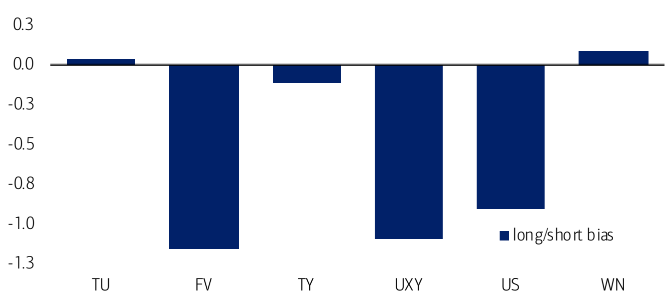
Exhibit 42: Analysis of proxies for futures positioning
Short bias in belly vs wings



Source: BofA Global Research

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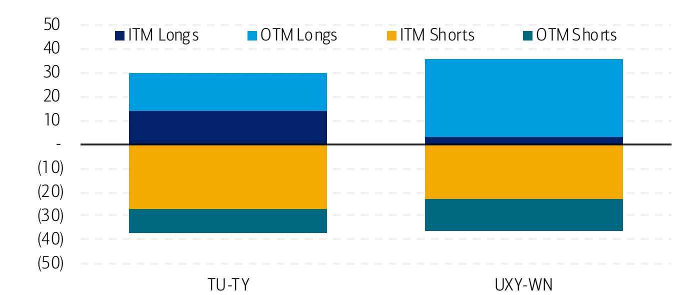
Exhibit 43: Proxies for futures positioning across the curve
Backend OTM shorts may put bull flattening pressure on the curve



Source: BofA Global Research

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Forward Volatility

Exhibit 44: 6m Forward Volatility
110.0bp for 6m fwd 1y10y

	1y	2y	5y	10y	30y
1m	136.1	139.9	128.2	112.0	97.5
3m	142.4	143.2	129.4	112.4	97.7
6m	153.4	148.5	130.6	112.1	97.7
1y	142.5	144.7	127.0	110.0	95.2
2y	143.0	136.5	120.9	105.0	90.5
5y	114.1	110.6	101.5	91.4	79.9
10y	88.9	87.2	81.5	76.1	68.7

Source: BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 45: 6m Fwd vol as % ATM
98% of ATM for 6m fwd 1y10y

	1y	2y	5y	10y	30y
1m	178%	121%	110%	106%	111%
3m	141%	110%	106%	100%	103%
6m	124%	107%	103%	99%	101%
1y	97%	100%	100%	98%	98%
2y	101%	100%	99%	97%	97%
5y	98%	98%	97%	96%	98%
10y	97%	97%	96%	97%	100%

Source: BofA Global Research

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Exhibit 46: 3m Z-Score 6m Fwd vol % ATM
-0.3 Z-Score for 6m fwd 1y10y

	1y	2y	5y	10y	30y
1m	1.6	1.7	2.3	0.8	0.9
3m	0.8	1.1	2.2	0.5	0.8
6m	0.8	1.2	1.9	0.4	0.9
1y	1.0	1.4	1.1	-0.3	0.5
2y	0.8	-0.4	-0.1	-0.5	0.3
5y	-0.8	-0.8	-0.7	-0.7	0.4
10y	-0.5	-0.1	-0.5	-0.6	2.0

Source: BofA Global Research

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Exhibit 47: 1y Forward Volatility
106.3bp for 1y fwd 1y10y

	1y	2y	5y	10y	30y
1m	153.6	145.0	128.1	110.0	94.4
3m	147.4	142.7	126.7	109.4	93.3
6m	144.4	141.2	125.5	108.3	92.4
1y	141.9	138.3	123.0	106.3	90.5
2y	135.3	130.3	117.7	101.1	86.6
5y	109.3	106.5	98.0	87.8	76.6
10y	86.0	84.2	78.8	73.6	66.6

Source: BofA Global Research

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Exhibit 48: 1y Fwd vol as % ATM
95% of ATM for 1y fwd 1y10y

	1y	2y	5y	10y	30y
1m	201%	125%	110%	104%	108%
3m	146%	110%	104%	98%	98%
6m	116%	102%	99%	96%	95%
1y	97%	96%	97%	95%	93%
2y	95%	95%	97%	94%	93%
5y	94%	94%	94%	92%	93%
10y	94%	94%	93%	94%	97%

Source: BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 49: 3m Z-Score 1y Fwd vol % ATM
-0.2 Z-Score for 1y fwd 1y10y

	1y	2y	5y	10y	30y
1m	1.7	1.6	2.1	0.7	0.8
3m	1.2	1.1	2.0	0.2	0.5
6m	1.3	1.1	1.7	0.0	0.4
1y	1.5	0.9	0.5	-0.2	0.0
2y	0.3	-0.1	0.3	-0.3	0.1
5y	-0.7	-0.6	-0.4	-0.6	0.1
10y	-0.5	0.0	-0.7	-0.9	1.9

Source: BofA Global Research

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Exhibit 50: 2y Forward Volatility
98.1bp for 2y fwd 1y10y

	1y	2y	5y	10y	30y
1m	118.5	118.6	113.0	95.9	81.3
3m	122.1	121.7	114.7	97.1	82.2
6m	124.9	123.9	115.5	97.6	82.6
1y	130.0	127.3	116.6	98.1	83.0
2y	124.9	119.1	110.7	94.0	79.6
5y	103.1	101.1	93.2	83.0	72.2
10y	82.1	80.3	75.1	70.1	63.9

Source: BofA Global Research

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Exhibit 51: 2y Fwd vol as % ATM
88% of ATM for 2y fwd 1y10y

	1y	2y	5y	10y	30y
1m	155%	102%	97%	91%	93%
3m	121%	94%	94%	87%	87%
6m	101%	90%	91%	86%	85%
1y	89%	88%	92%	88%	86%
2y	88%	87%	91%	87%	85%
5y	88%	89%	89%	87%	88%
10y	89%	89%	89%	89%	93%

Source: BofA Global Research

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Exhibit 52: 3m Z-Score 2y Fwd vol % ATM
0.8 Z-Score for 2y fwd 1y10y

	1y	2y	5y	10y	30y
1m	1.7	1.8	2.2	1.0	0.7
3m	1.3	1.5	2.2	1.0	0.6
6m	1.6	1.7	2.1	1.0	0.6
1y	2.0	2.0	1.8	0.8	0.4
2y	1.6	1.3	1.5	0.9	0.3
5y	0.1	0.4	0.4	-0.3	0.1
10y	-0.4	0.5	-0.6	-1.0	1.6

Source: BofA Global Research

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Exhibit 53: 3y Forward Volatility
93.3bp for 3y fwd 1y10y

	1y	2y	5y	10y	30y
1m	103.8	106.8	104.9	91.0	75.1
3m	109.9	110.5	106.7	92.2	76.3
6m	115.4	113.2	107.9	92.9	77.0
1y	123.6	116.3	108.8	93.3	77.3
2y	112.6	109.6	102.2	89.6	75.1
5y	97.7	96.0	89.0	78.6	68.0
10y	79.1	77.5	72.6	67.7	61.9

Source: BofA Global Research

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Exhibit 54: 3y Fwd vol as % ATM
83% of ATM for 3y fwd 1y10y

	1y	2y	5y	10y	30y
1m	136%	92%	90%	86%	86%
3m	109%	85%	88%	82%	80%
6m	93%	82%	85%	82%	79%
1y	84%	81%	86%	83%	80%
2y	79%	80%	84%	83%	81%
5y	84%	85%	85%	83%	83%
10y	86%	86%	86%	86%	90%

Source: BofA Global Research

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Exhibit 55: 3m Z-Score 3y Fwd vol % ATM
1.3 Z-Score for 3y fwd 1y10y

	1y	2y	5y	10y	30y
1m	1.3	1.4	1.9	1.3	0.7
3m	1.0	1.1	2.0	1.5	0.6
6m	1.2	1.2	1.8	1.6	0.6
1y	1.2	1.0	1.5	1.3	0.2
2y	0.0	0.2	0.8	1.1	-0.4
5y	0.5	1.0	0.8	-0.3	0.1
10y	-0.2	0.5	-0.8	-1.1	1.4

Source: BofA Global Research

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Ratios implied/delivered

Exhibit 56: Implied vs. Delivered (21d) Ratio
Ratios of Implied to 21d delivered still >100% virtually across the grid, richness significant on left

	1y	2y	3y	5y	7y	10y	30y
1m	113%	123%	111%	108%	102%	101%	100%
3m	117%	124%	115%	109%	106%	105%	108%
6m	115%	120%	112%	108%	106%	105%	109%
1y	115%	114%	111%	106%	103%	102%	109%
2y	110%	107%	104%	101%	100%	100%	105%

Source: BofA Global Research

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Exhibit 57: Implied vs. Delivered (63d) Ratio
Ratios of Implied to 63d delivered >100% for gamma and right side, belly relatively cheap vs wings

	1y	2y	3y	5y	7y	10y	30y
1m	115%	112%	98%	100%	97%	100%	103%
3m	115%	112%	103%	101%	102%	104%	111%
6m	108%	107%	101%	101%	102%	104%	113%
1y	102%	101%	101%	100%	101%	102%	113%
2y	97%	99%	98%	99%	100%	102%	109%

Source: BofA Global Research

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Exhibit 58: 3m Z-Scores for Implied vs. Delivered (21d) Ratio
Ratios of implied/21d delivered rich for intermediates on the right side

	1y	2y	3y	5y	7y	10y	30y
1m	-1.2	-0.3	-0.2	0.1	0.0	0.0	-0.6
3m	-0.4	0.4	0.4	0.4	0.4	0.3	-0.3
6m	0.2	0.7	0.7	0.7	0.6	0.3	-0.3
1y	0.8	1.2	1.2	1.0	0.6	0.2	-0.2
2y	1.3	1.2	0.9	0.5	0.2	-0.1	-0.3

Source: BofA Global Research

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Exhibit 59: 3m Z-Scores for Implied vs. Delivered (63d) Ratio
Ratios of implied/63d delivered rich on the left vs right

	1y	2y	3y	5y	7y	10y	30y
1m	0.9	0.9	-0.4	-0.4	-0.6	-0.5	-0.9
3m	1.8	1.8	0.8	-0.1	-0.2	-0.3	-0.7
6m	1.8	1.8	1.1	0.4	0.0	-0.4	-0.8
1y	1.8	1.6	1.4	0.5	-0.1	-0.7	-0.8
2y	1.1	0.7	-0.1	-0.7	-1.0	-1.2	-1.2

Source: BofA Global Research

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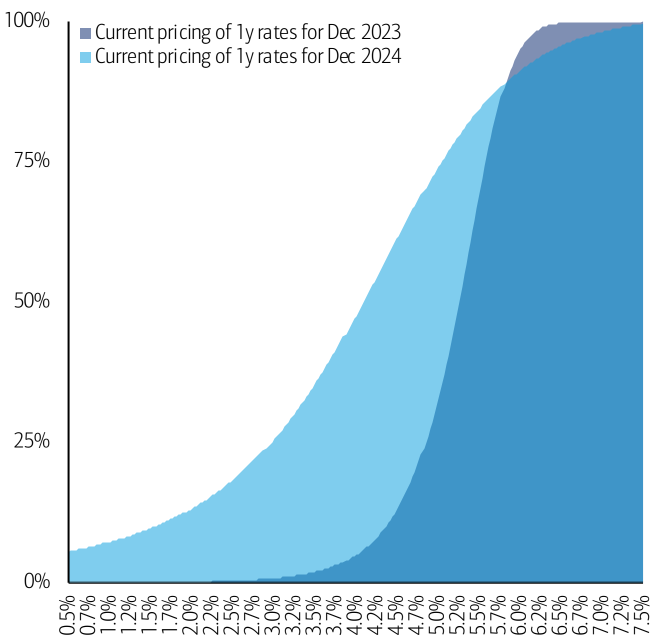
Rates probability distributions

Exhibit 60: CDF for 1y SOFR rates at end-2023 and end-2024
1y rate cumulative distribution functions



Source: BofA Global Research

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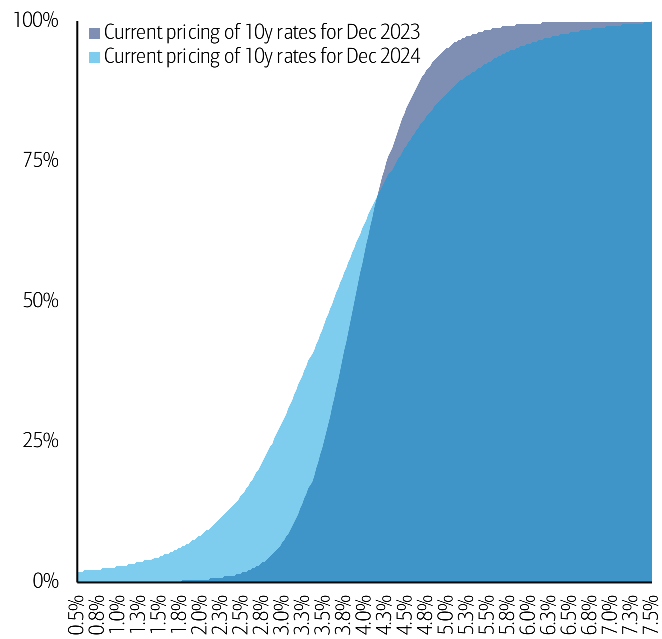
Exhibit 61: CDF for 10y SOFR rates at end-2023 and end-2024
10y rate cumulative distribution functions



Source: BofA Global Research

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Trade activity

Exhibit 62: Payer volumes over the last week ($m notionals)
Demand for payers over the last week

Payers	1y	2y	3Y	4Y	5Y	7Y	10Y	20Y	30Y	
<1m	3100	2300					530		175	10105
1m	2600	3107	100	100	530	170	2003	200	1082	21696
3m	5980	1950			350		915			11935
6m	8028	540			580		782	25	416	10371
1y	11006	4240			988	340	608	120	400	17702
2y	1200	610	480	240	390		230	50	65	3265
3Y		350	240				250	83	25	948
4Y				230	218	170	150	150		918
5Y					450		125	6	88	669
7Y							268	75	25	368
10Y							415			415
20Y										
30Y										
	31914	13097	820	570	3506	680	6276	709	2276	78392

Source: BofA Global Research; SDR; Bloomberg

BofA GLOBAL RESEARCH

Exhibit 63: Receiver volumes over the last week ($m notionals)
Demand for payers over the last week

Receivers	1y	2y	3Y	4Y	5Y	7Y	10Y	20Y	30Y	
<1m	3100	13					350	25	125	7613
1m	1600	2443	100	100	315		2082		1319	14602
3m	6580	2190			350		915		15	11990
6m	2990	1020					795		40	5035
1y	6937	2780			600		610	120	100	11147
2y	1200	210	240	240	390		230	50	65	2625
3Y		350					370	83	135	938
4Y				170	259		59	150		638
5Y					450		125	6	38	619
7Y							268	75	25	368
10Y							415			415
20Y										
30Y										
	22407	9006	340	510	2364		6219	509	1862	55990

Source: BofA Global Research; SDR; Bloomberg

BofA GLOBAL RESEARCH

Exhibit 64: Straddle volumes over the last week ($m notionals)
Demand for payers over the last week

Straddles	1y	2y	3Y	4Y	5Y	7Y	10Y	20Y	30Y	
<1m					60					60
1m					340		77		60	527
3m										
6m	516				100		37			653
1y		350								600
2y										
3Y										
4Y				50	1		50			101
5Y										
7Y										
10Y							100	300		400
20Y										
30Y										
	516	350		50	501		264	300	60	2341

Source: BofA Global Research; SDR; Bloomberg

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Formosa issuance

Exhibit 65: 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

BofA GLOBAL RESEARCH

Exhibit 66: 2023 Formosa issuance YTD ($m)
Very limited issuance YTD

	2	5	7	10	15	20	25	30
1								
2				370				
3		40		60				
4		205		365				
5				135		15	15	
7								
10								25
15								
20								
25								
30								1000

Source: BofA Global Research, Bloomberg

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Exhibit 67: 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		1164		1485		22177
3		40		170	20	240	225	15536
4		220		544	50	25	275	2441
5				155	445	1512	368	111658
7			30					5624
10				2000				4489
15								
20								
25								
30								6500

Source: BofA Global Research, Bloomberg

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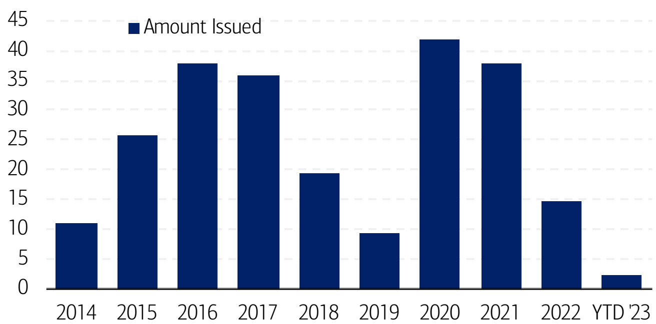
Exhibit 68: Total issuance per year since 2014 ($bn)
Very limited Formosa issuance YTD (c.$2.26bn)



Source: BofA Global Research, Bloomberg

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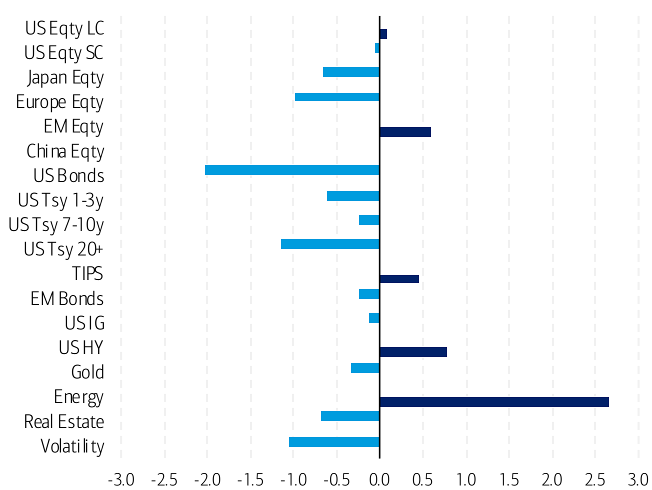
Allocation bias from ETF flows

Exhibit 69: Allocation bias from ETF flows – week ending 9/8
Short equity vol increased as short duration bias increased



Source: BofA Global Research

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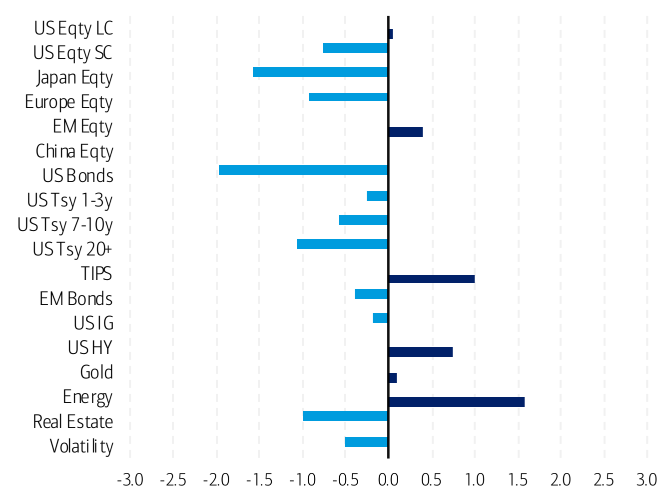
Exhibit 70: Allocation bias from ETF flows – week ending 9/1
Late August fading of risk-on bias clear in ETF flows



Source: BofA Global Research

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Notes

Exhibit 17: 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 18/20/22: 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 19/21/23: 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 28/29: In a payer/receiver ladder one buys the ATM strike and then you sell ATM+/-x and ATM+/-2x. In the terminal payoff diagram the position starts losing money when the forwards move past ATM+/-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+/-(x+delta) and ATM+/-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 30/31: 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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