Global Rates Viewpoint

Rates vol heading into 2021

23 November 2020

Rates Research
Global

Global Rates Research
MLI (UK)

Bruno Braizinha, CFA
Rates Strategist
BofAS
+1 646 855 8949
bruno.braizinha@bofa.com

Sphia Salim
Rates Strategist
MLI (UK)
+44 20 7996 2227
sphia.salim@bofa.com

For a list of open recommendations and corresponding risks please see here and here

US vol - The only ways is… up?

As the dust settles on the elections it seems likely that the next administration will be faced with Congressional gridlock. While this decreases expectations for fiscal stimulus and makes the rates view more contingent on vaccine scenarios, we maintain our bias for slightly higher yields (1.25-1.5% by end-2021) and steeper curves medium term.

In volatility space, the Fed is likely to continue to collapse volatility on the left side of the grid. On the right side of the grid, we expect some directionality between vol and rates medium term. FAIT, an asymmetry of outcomes in the rates tilted to the upside, and a change in the utility of rates as portfolios hedges all support volatility and payer over receiver skews for short and intermediate expiries on the right side of the grid.

While the baseline scenario supports right side volatility, the levels we are projecting here (1y10y vol centered at 70bp) are in the context of the volatility range for the last couple of years. We see medium-term rate volatility less as an asset class to be traded in itself and more as tool to express macro views on the direction of rates and curve.

A context of higher rates and steeper curves that may provide some support for delivered volatility, and implied volatility levels that likely to stay relatively contained, suggest a more tactical environment for short gamma in 2021.

The outlook for vega is likely more balanced and we see the current levels as relatively attractive to scale into long vega exposure with positive carry around the 5y30y tenor.

EUR vol – support for gamma on short and long tails

After surging in March, implied vols have normalized back to pre Covid levels on almost all points of the surface, bar the top left and 30y tails. We see several factors that should continue to support gamma on short tails (notably changes to TLTRO details and the ECB's framework review) and on long tails (with uncertainty around the timeline of structural changes due to the Dutch pension reform and insurers' Solvency II review). Vol on 5-10y tails could however stay depressed, as we settle in a tight trading range.

Trade recommendations

We favor expressing our view for higher yields and steeper curves medium-term through conditional bear steepeners or cap spreads in the 5s30s sector, with expiries around 1y. Because we expect the US rates momentum to be back-loaded in 2021, we favor calendar spreads in payers, selling the shorter expiry to finance longer expiries. Cross market, the recent convergence between the US and European vol grids and the higher yields expected in Treasuries vs Bunds supports payers in US vs Europe.

Message from the skews

As we update our analysis from 2018, we still find that historically large 3M changes in skews are useful indicators of the potential for an outperformance / underperformance relative to the forwards in the following month. We could interpret this as showing that payer and receiver skew changes, in some sense, offer a good indication of positioning. In the long run, duration follow vol traders in the US and do the opposite in Europe.

US rates vol: The only way is.... Up?

US rates volatility made historical lows in 2020, in a process of Europeanization of the volatility grid which we anticipated to some extent in Rates volatility and the zero lower bound. To understand the volatility outlook medium term we should start by defining the broad view for the rates and curve.

As the dust settles on the elections it seems somewhat likely that whatever the outcome of the presidential race the next administration will be faced with Congressional gridlock, which decreases size expectations for US fiscal stimulus. We reflect these developments in our views for US rates and curve, and expand on the implications for rates volatility outlook medium term.

Duration and curve view

A dovish Fed and enhanced forward guidance will keep the front end and belly pinned near zero. The back end of the rates curve will now likely be driven more by expectations for vaccine progress rather than large fiscal support. A change in the Fed response function toward FAIT continues to support a repricing of neutral rate expectations in 2021, 10yT in the 1.25-.5% range and a corresponding steepening of the curve.

From a fundamental perspective the move is likely to be back-loaded in 2021 (Table 1). Although faster than expected progress on vaccine distribution may risk front-loading some of this move, it is easy to argue also that case counts going into the winter may support persistent uncertainty around the outlook. This suggests expressing our duration and curve views at a longer horizon in 2021, to avoid near-term uncertainty.

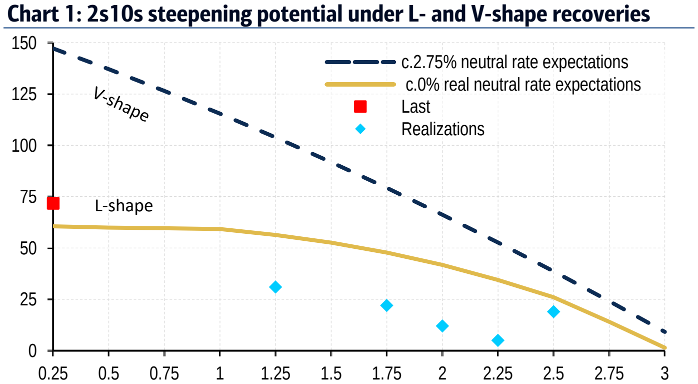
Moreover, we continue to think that a move beyond 1.5% and towards the 1.75-2% levels that are consistent with V-shape scenarios (see Chart 1) requires solid backing from fundamentals. We see a few arguments that suggest some consolidation on the 2s10s curve around 100-125bp, including the recovery of the hedging role for USTs and the potential for negative feedback loops between bond yields and risky assets around this range (see here).

Table 1: Government bond yield forecasts

	Q4 20	Q1 21	Q2 21	Q3 21
3mL	0.25%	0.20%	0.20%	0.20%
2yT	0.15%	0.20%	0.25%	0.25%
5yT	0.35%	0.40%	0.40%	0.45%
10yT	0.90%	1.00%	1.15%	1.35%
30yT	1.65%	1.75%	2.00%	2.25%
2s10s	75bp	80bp	90bp	110bp
5s30s	130bp	135bp	160bp	180bp

Source: BofA Global Research

Chart 1: 2s10s steepening potential under L- and V-shape recoveries



Source: BofA Global Research

Implications for volatility.... left side vs. right side

We think the Fed is likely to continue to collapse volatility on the left side of the grid, particularly in scenarios of economic rebound in 2021, which constitute our baseline. The rationale for flows on the left side under these scenarios is likely to be concentrated on positioning (or hedging) for a sooner-than-expected hawkish repricing of Fed expectations through payer structures in tenors around 2y2y or 2y3y or forward vol.

On the right side of the grid, we expect some directionality between volatility and rates medium term. Indeed, we have argued recently that FAIT, an asymmetry of outcomes in rates space tilted to the upside given the impact of the zero lower bound (ZLB), and a change in the utility of rates as portfolios hedge all support volatility and payer over receiver skews for short and intermediate expiries on the right side of the grid.

To gauge the potential move in normal vol we focus on the 1y10y point and note how implied vols have changed meaningfully as a percentage of the forwards (Chart 2), from c.20% in early 2019, to c.45% as the trade war news flow impacted the rates market in mid/late-2019, and to c.100% between February and August 2020 at the peak of the coronavirus market turmoil. Since then the ratio has decayed toward c.60% and it is likely that in our baseline scenario this ratio continues to decrease to around the 45-55% range (the top half of the 2019 range).

Chart 2: 1y10y implied volatility ratio to 1y10y forward

Source BofA Global Research

Chart 3: 1y10y normal volatility range expected 2021

Source: BofA Global Research

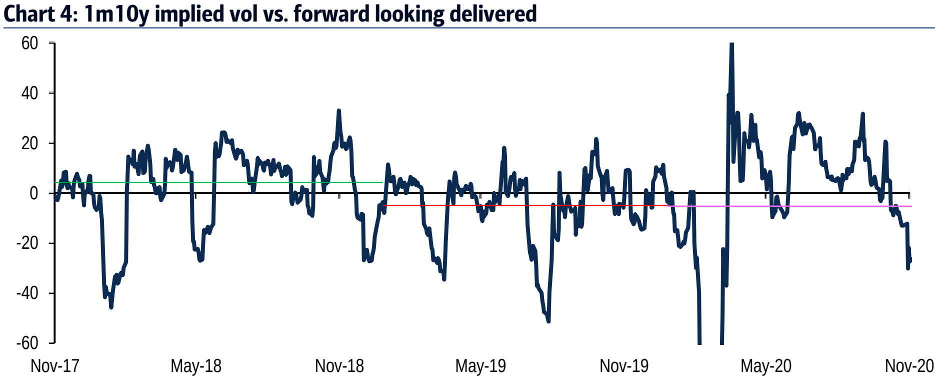
Our scenario for 1.25-1.5% for 10yT by mid/late-2021 implies a similar range in swaps (at constant spreads) and with the 45-55% range in lognormal vols implies 1y10y normal vol around 70bp (around the top end of the recent range – see Chart 3), roughly in the c.55-80bp range.

While we do expect the baseline scenario to support higher volatility, the levels we are projecting here for 1y10y, centered at 70bp, are at or just marginally higher than the top end of the volatility range for the last couple of years. What this means in our view is that rate volatility medium term, and particularly intermediate expiries on the right side of the grid, are less of an asset class to be traded in itself and more a tool to express macro views on the direction of rates and curve.

More challenging environment for short gamma

The dynamic of gamma in 2020 can be separated in two periods: (1) the COVID repricing phase, where short gamma performed very poorly (see Chart 4) as delivereds outperformed; and (2) the period after the repricing where the short gamma bias performed rather well as rates were floored by the Fed's ZLB (which meant that it was difficult for nominal rates to deliver) and a significant uncertainty around the outlook from COVID and elections supported a relatively wide spread of implieds to delivered (which is what short gamma strategies are expected to harvest).

Chart 4: 1m10y implied vol vs. forward looking delivered



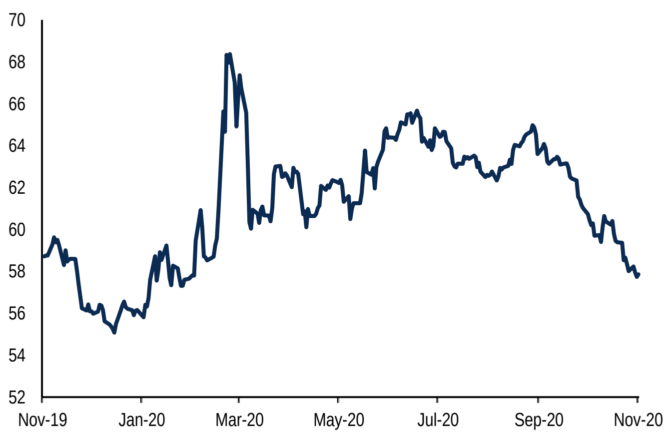
Source: BofA Global Research

Going forward we expect a more challenging environment for short gamma as: (1) the context of higher rates and steeper curves described above is likely to provide some support for delivered volatility; and (2) implied volatility is likely to stay relatively contained (with expectations for 1y10y centered at c.70bp). Indeed, there no calendar risk overhang like the elections to support wider spreads of implied to delivered, and COVID premium is likely to dissipate as clarity on the vaccine timeline increases. All this suggests a more tactical environment for short gamma in 2021.

Vega

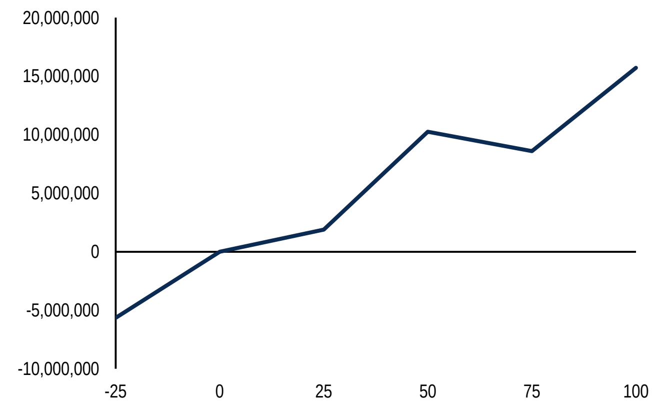
Similarly to the gamma sector, the dynamic of the LRC of the grid in 2020 also had two distinct periods. The rally in the first part implied meaningful buying needs in vega space from Bermudan books as they rebalanced their exposure, and that along with demand for forward vol positions was more than enough to offset the vega supply from replacement issues and Formosa issues got called in the lower rate environment. In the latter part of the year, however, with rates squarely in a range and continuing supply of vega from replacement issues pushed vega to the recent lows (see Chart 5).

Chart 5: 5y30 vol dynamic in 2020



Source: BofA Global Research; Bloomberg

Chart 6: Bermudan vega exposure (LRC of the grid only) under different rate scenarios (parallel shifts on the curve between -25bp and +100bp)



Source: BofA Global Research

The outlook for vega in 2021 is likely more balanced:

1. The macro backdrop and our view for rates and curve medium term are supportive for right side volatility, particularly for intermediate expiries but that may extend out to intermediate vega;

2. Rollup on the grid for long intermediate vega positions is likely to persist;

3. Some offsetting of vega exposure between older vintages and new issuance (see LRC and Bermudan exposure in a selloff and Chart 6 where we update the exposure estimates by increasing the granularity on the grid and carve out corporate issuers);

4. Formosa issuance is likely to be more subdued as we estimate roughly $15bn worth of issuance to be called in 2021, versus almost $40bn in 2020. There is some uncertainty on the latter estimate, including: the pace of growth of Taiwanese life insurance industry asset base, diversification into other products and currency exposure, view for the dollar.

However, as we argued recently, broadly we see the current levels as relatively attractive to scale into long vega exposure with positive carry around the 5y30y tenor.

EUR vol: support in short and long tails

Like in USD, 2020 was a roller-coaster year for EUR rates vol

As in other markets, EUR implied vols surged in March as the Covid crisis hit, the impact was most significant in long tails as the 10s30s curve recorded a substantial flattening, to the point of inversion. Table 2 shows the changes from pre-covid (Jan 21st) to peak vol levels on Mar 23rd.

What is most striking is the extent to which vol levels have normalized since. Table 3 highlights that we are back to pre-covid levels across expiries in the 5-10y tails. It is only in the top left and in the 30y tail that volatility remains somewhat higher. In the top left, this is consistent with our call from April, where we argued that the many changes the ECB was going to make to its instruments should be supportive of higher delivered volatility in the front-end (see Long top left EUR vol vs top right US vol).

Table 2: Covid induced surge in imp vol –21-Jan to 23-Mar (bp/annum) …

expiry\tail	1Y	2Y	5Y	7Y	10Y	30Y
3M	25.2	23.8	27.4	35.3	45.1	86.5
6M	20.0	18.7	20.9	27.5	35.6	66.2
1Y	16.2	15.7	17.6	22.3	28.9	48.2
2Y	10.4	10.1	15.8	19.8	25.0	35.2
3Y	10.1	10.5	14.2	17.0	21.0	27.6
5Y	9.8	9.8	11.4	12.9	14.9	18.3
10Y	5.7	5.8	7.1	7.4	7.8	7.6

Source: BofA Global Research

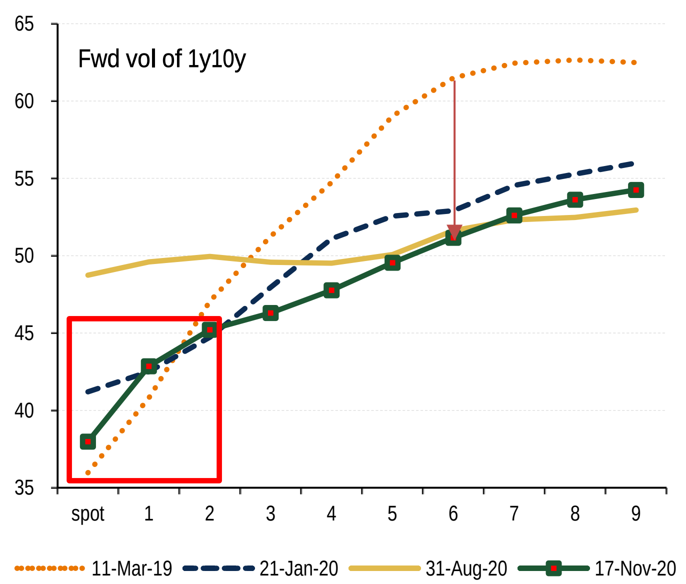
Table 3: … has more than reversed. Most vols now sub Jan 21st levels

expiry\tail	1Y	2Y	5Y	7Y	10Y	30Y
3M	2.5	0.6	-5.9	-5.5	-5.0	1.8
6M	2.8	1.0	-5.3	-5.0	-4.5	1.3
1Y	2.5	0.3	-4.4	-3.4	-3.2	1.1
2Y	-0.9	-2.1	-3.6	-2.9	-1.6	0.9
3Y	-3.3	-3.3	-3.5	-2.3	-0.9	0.7
5Y	-3.8	-3.0	-3.4	-2.6	-1.1	0.1
10Y	-1.2	-1.1	-0.9	-0.8	-0.6	-0.4

Source: BofA Global Research

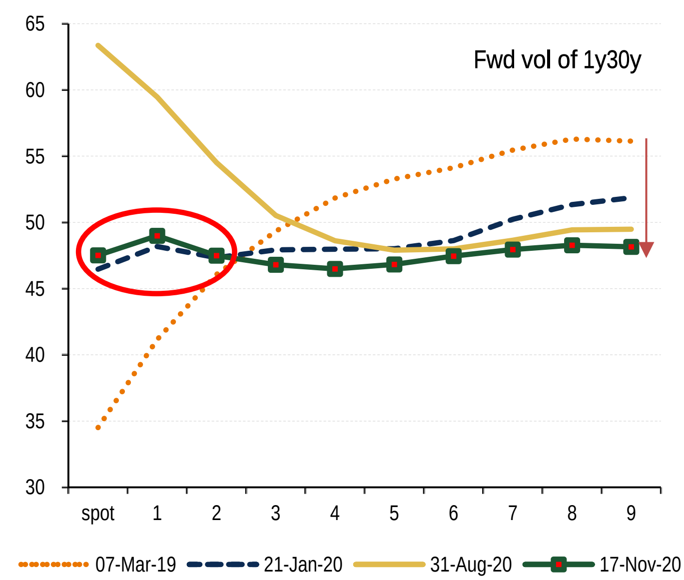
The below charts of the term structures of 1y10y and 1y30y implied volatility present another great summary of what happened since March, and where we are now. They also highlight the importance of EUR callable flows this year, which drove a larger correction in long dated forward vol (with the 4y+ forwards sitting below January levels).

Chart 7: Term structure of 1y10y EUR implied vol, at diff point in time



Source: BofA Global Research

Chart 8: Term structure of 1y30y EUR implied vol, at diff point in time



Source: BofA Global Research

Still distinguish 5-10y tails from shorter and longer tails

Top left to remain supported by ECB communication & actions

There are several reasons why we would not position for a normalization in the top left, as happened with 5-10y tails:

- We expect changes to TLTRO III terms that would have the potential to drive lower Euribor forwards up to Jun 2022, and support volatility in the top-left. Our economists forecast at least a lengthening of the period over which banks benefit from the lowest possible TLTRO borrowing rate of Depo-50bp, beyond Jun21 and possibly up to Jun22. There could also be an improvement in that rate, for e.g. if some governments do not fully extend their bank loan guarantee schemes.
- Our economists project that the ECB will raise the tiering multiplier in December from 6x to 8-9x. While such an increase should be modest enough not to move front-end fixings, a larger increase in December or later could put upward pressure on rates (see note on ECB policy choices & the front-end).
- There is still the tail risk of a deterioration in the health of European banks' balance sheets, which would push longer-dated Euribor rates higher.
- Last but not least, as we had argued at the end of last year, the ECB's framework review, which has been pushed from 2020 to mid-2021, can create a lot of noise around the outlook for the front-end. Communication ahead of the conclusion of the review could be confusing and generate volatility. Indeed, the ECB will have to balance the need to remain dovish and convince markets it can achieve its (new) inflation target with the need to review the tools (notably negative rates) and their sustainability in light of the pressure they put on the banking system.

More upside for gamma in the 30y tail given Pension & Insurance reforms
Between now and mid-2021, some factors could drive further bull flattening of the curve, notably that some Dutch pension funds, that have not done so already, will have to adjust to the change in the discount curve on Jan 1st – for them this will result in the need to receive rates beyond the 20y point. Also, on the insurers' side, we are still waiting for EIOPA's recommendations on the Solvency II review (now due in December 2020). These may also include a change in the Solvency discount curve that would result in some demand from insurers to receive long-end rates (see here).

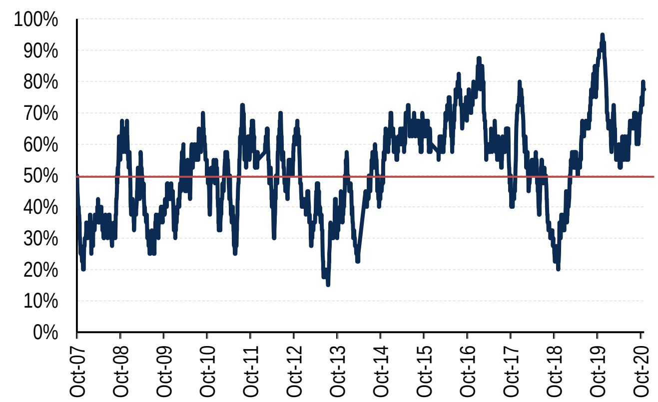
We recognize that two points should limit the scope for large bull flattening moves from mid-2021 onwards:

(1) When the ECB concludes its framework review, we expect it will be clear that it will not want to rely on additional rate cuts. This limits the probability of a repeat of the sharp August 2019 bull flattening, when the market had to reassess the level of the low bound, triggering large bank ALM receiving needs in the long-end, followed by receiving from Pension and Insurers.

(2) The Dutch Pension Reform, which is due to be voted in parliament mid 2021 should make Dutch pension funds less keen on receiving (ultra) long-end rates in a rally. If anything, it could make funds start to think about unwinding some of their long-end receive positions, depending on the regulatory framework that will be put in place during the transition period to the new Defined Contribution system. The draft regulation for the new system as well as the transition framework could inform us on the potential for this dynamic to unfold from next year. It is due to be presented for consultation anytime now (see here).

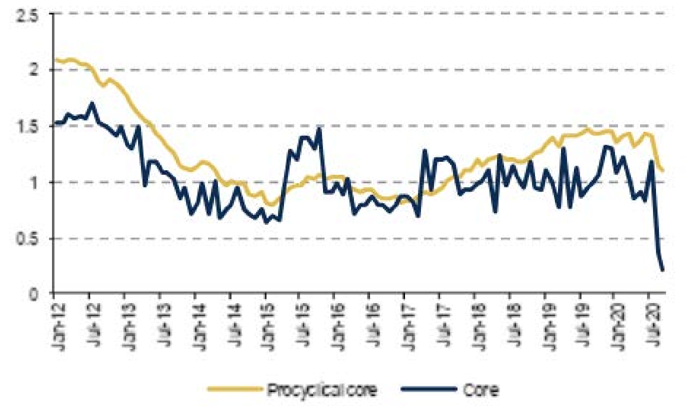
With such uncertainty around regulatory reforms for pensions and insurers, and taking into account that, so far, the curve continues to be driven by the long-end (Chart 9), our bias is to be long gamma on the 30y tail, even if it hasn't corrected as much as gamma on intermediate tails.

Chart 9: Percentage of daily 10s30s moves that are long-end driven*



Source: BofA Global Research. (*) Based on daily changes on a 2-month rolling window.

Chart 10: Procyclical core inflation back to 2017 levels



Source: BofA Global Research

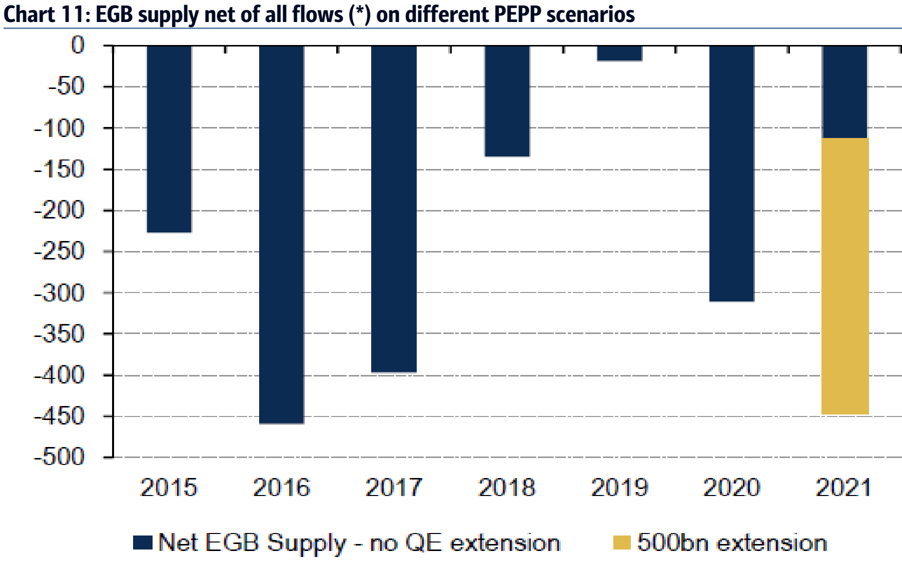
Neutral to bearish gamma on 10y tail

If we were to pick a tail where to be short vol, it would be the 10y, as we believe the extent of any selloff there is likely to be limited by ECB action. The richening of the receiver skew in 3m10y does suggest potential for a selloff in the very near term (see Appendix 1 below), but thinking about the months to come in general, we believe that many macro factors point to a tight trading range in the belly of the EUR curve, and an outperformance vs US rates, in particular:

- The outlook for inflation is likely to be very weak, and necessitate a dovish central bank, even under the scenario where European growth rebounds by more than expected next year. Indeed, Eurozone inflation expectations were already de-anchoring to the downside before the Covid crisis. And even if the crisis resolves itself with an earlier than expected vaccine deployment, the ECB will have to account for the fact that the shock has wiped out two and a half years of progress on the inflation front in the space of six months (see here and Chart 10for our economists' preferred measure of inflation).

- Net supply will remain negative in Euro government bond space, even if the ECB delivers only a limited increase in its Pandemic Emergency Purchase Programme – see Chart 11 below, and full analysis in Euro debt in 2021: big deficits, bigger QE

Chart 11: EGB supply net of all flows (*) on different PEPP scenarios



Source: BofA Global Research, ECB, Bloomberg. Numbers in EUR billions. (*) Net supply means gross EGB issuance (top 10 markets) minus buybacks, coupon repayments, redemptions and net QE flows.

Trade recommendations

We continue to like expressing our view for higher US yields and steeper curves through:

- Buying US 1y30y payer spreads (atm+10bp/atm+50bp) financed by selling 1y5y atm+10bp payers. The trade is costless (indicative) and locks in a flat entry level on the curve relative to the forwards (roughly 75bp). The main risk on the position is a bear-flattening scenario for the 5s30s curve, with potentially unlimited downside.

- A 1y expiry US 5s30s cap spread atm/atm+45bp with an indicative price of 12.5bp and a breakeven on the trade at 87.5bp. The risk is limited to the upfront premium.

Imbedded in these trades is the view for likely consolidation in a selloff around the 1.25-1.5% range for 10yT and 2-2.25% range for 30yT (or 1.65-1.9% for 30y swaps at constant spreads). These trades also bridge the near-term uncertainty and more clarity around the view in 2H21. Indeed, as we noted above, the path towards higher yields and steeper curves may be somewhat turbulent near-term, which is expressed in our forecasts by a shallower path for rates in 1H21 vs. 2H21. Consistent with this view it also makes sense to:

- Buying 1y10y payer spreads atm+15bp/atm+50bp partially financed by selling 3m10y atm+15bp, with an indicative cost of 1.5bp of delta. The main risk on the position is a faster than expected selloff near-term which eventually fades medium term, with potentially unlimited downside.

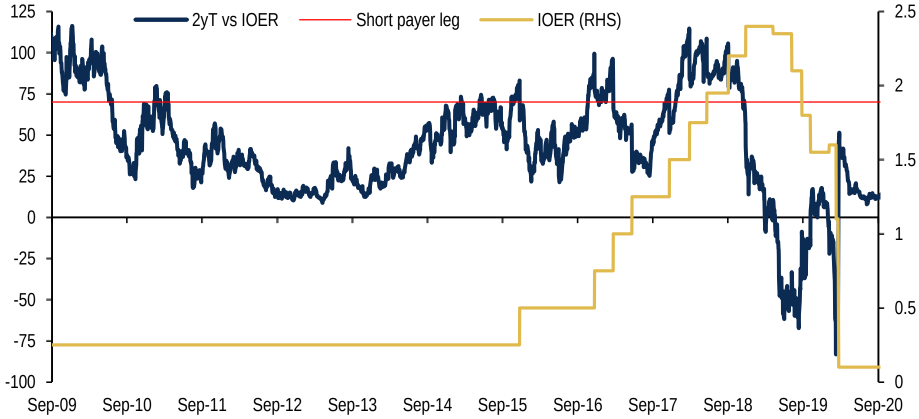
Cross market, we have seen over the last year a convergence between the US and European vol grids (the Europeanization theme we mentioned earlier). The right side has been more resilient to this convergence, and we expect that resilience to persist in 2021, which together with higher yields expected in Treasuries vs Bunds (roughly 50bp selloff expected in 10yT into 4Q21 vs 10bp in Bunds) supports payers in US vs Europe:

- We recommend buying a $100mln 1y10y 1%/1.30% payer spread in USD, financed with the sale of €85mln (beta and FX weighted) 1y10y -0.05% payer in EUR (see here). The risks to the trade are an ECB disappointment, or a scenario of a substantial selloff in both currencies with potentially unlimited downside.

Despite our bullish economic bias for 2021, we acknowledge that there are downside risks to the outlook, including the potential for vaccine scenarios to disappoint, and for political uncertainty and gridlock to continue to weigh on the outlook. To hedge these scenarios we favor buying 6m30y receiver ladders (atm-20bp/atm-45bp/atm-70bp) financed by selling 6m5y receivers atm-20bp. The trade is costless (indicative) and positions for a rally in 30y rates into the 75-100bp range on a risk-off. The main risk on the trade is a bull steepening scenario for the 5s30s curve, with potentially unlimited downside. Because the position is short the low strikes it is also exposed to rallies in 30y beyond these strikes, even in bull flattening scenarios.

Even in the context of downside risks to the outlook, the likelihood of negative rates scenarios remains remote. Yet, we continue to think it is work hedging for this risk and favor buying receiver spreads on the left side of the grid financed by selling payers: 2y2y receiver spreads atm-10bp/atm-40bp financed by selling 2y2y payers atm+25 (80bp currently - Chart 12) which is costless indicative. Carry on the position is 3bp/y, and the main risk on the trade is a selloff in the frontend of the US curve, likely driven by a hawkish repricing of Fed expectations, with potentially unlimited downside (see here).

Chart 12: Spread of the 2y swap vs IOER and the short payer leg on the NIRP trade



Source: BofA Global Research

Appendix (1) – Messages from the skews

While implied volatilities are declining back to historical lows in many tenors across EUR and USD rates, moves in receivers and payer skews are proving interesting, consistent with the fact that low implied vol levels make swaptions an attractive instrument for hedging or expressing duration views.

As we update our analysis from 2018, we still find that historically large 3M changes in skews are useful indicators of the potential for an outperformance / underperformance relative to the forwards in the following month. We could interpret this as showing that payer and receiver skew changes, in some sense, offer a good indication of positioning.

In the long run, follow vol traders in the US and do the opposite in Europe
Interestingly, and consistent with earlier results, we find that in general investors should position in line with vol traders in the US and do the opposite in Europe.

A richening in payers tend to precede a duration sell-off in the US (relative to the forwards), while, in EUR rates, it's a richening in receivers that would indicate risks of a sell-off. It is as though positioning in EUR swaptions was moving in synch with that in cash (i.e. options being used to express views), while US swaptions may be more used to hedge positions or can adjust more correctly to macro drivers.

Based on monthly data since 2014 (when QE started being priced in EUR, and inflation dynamics in the US changed), we find that the message from 3m changes in skews is clearest for receivers in EUR, and for both receivers and payers in long tails in the US. Using a longer history provides even clearer results across the board, but we limit ourselves to data since 2014 given rates and vol dynamics could be thought as different.

Table 4 and 2 present the frequency of times where it would have been beneficial to pay the 1m forward rate (i.e. where the spot rate ended up above the 1m forward rate in the month that followed each observation), depending on the percentile move in the skew (3m expiry). It notably shows that 10y US rates have underperformed the 1m forwards about 64% of the time after 3m10y payers richened (as measured by 3m change in the payer skew being in the >0.66 percentile), against just 49% of the time on average over all the whole period (see unconditioned column). On the other hand, it is a richening in 3m10y EUR receiver skews that had a tendency to be followed by an underperformance in rates (52% of happening versus 43% in unconditional case). Table 3 and 4 present the median returns on a receive 1m forward position, supporting this message.

Table 4: % of times that EUR swap rates rise beyond the forwards in the month that follows the move in skew, classified by percentile skew move

		Skew Percentiles		
	unconditioned	<0.33	0.33-0.66	>0.66
2y rec	38%	27%	39%	44%
5y rec	41%	36%	33%	52%
10y rec	43%	32%	46%	52%
30y rec	47%	52%	33%	56%
	unconditioned	<0.33	0.33-0.66	>0.66
2y pay	38%	40%	46%	28%
5y pay	41%	40%	42%	40%
10y pay	43%	44%	46%	40%
30y pay	47%	48%	46%	48%

Source: BofA Global Research. Using monthly data from Sep-14 to Oct-20. Skew: 25bp OTM-ATM vol
We color the boxes in green (red) when the percentage of sell-offs is more than 5ppt lower (higher) than in both the unconditioned and 33-66 percentile cases.
The boxes that are bordered correspond to where the skews currently sit, percentile wise, on Nov 16th

Table 5: % of times that US swap rates rise beyond the forwards in the month that follows the move in skew, classified by percentile skew move

		Skew Percentiles		
	unconditioned	<0.33	0.33-0.66	>0.66
2y rec	47%	48%	58%	36%
5y rec	51%	52%	54%	48%
10y rec	49%	64%	42%	40%
30y rec	50%	64%	38%	48%
	unconditioned	<0.33	0.33-0.66	>0.66
2y pay	47%	32%	63%	48%
5y pay	51%	52%	50%	52%
10y pay	49%	44%	38%	64%
30y pay	50%	44%	46%	60%

Source: BofA Global Research. Using monthly data from Sep-14 to Oct-20. Skew: 25bp OTM-ATM vol
We color the boxes in green (red) when the percentage of sell-offs is more than 5ppt lower (higher) than in both the unconditioned and 33-66 percentile cases.
The boxes that are bordered correspond to where the skews currently sit, percentile wise, on Nov 16th

The change in the utility of US rates as portfolios hedge, away from buying duration to hedge risk off, and towards buying payers to hedge the likely impact of higher rates on risky asset valuations, could reinforce the bearish rates signal of richer US payers.

Table 6: EUR swaps: median one month basis point P&L on a receive position in the 1m forward rate, classified by percentile skew move

	unconditioned	<33	33-66	>66
2y rec	1.4	2.1	1.0	0.8
5y rec	3.8	4.2	5.7	-0.5
10y rec	3.9	8.4	3.1	-0.4
30y rec	1.2	-1.2	6.0	-2.3

	unconditioned	<33	33-66	>66
2y pay	1.4	1.0	0.9	2.2
5y pay	3.8	4.7	4.5	3.1
10y pay	3.9	4.0	3.3	2.7
30y pay	1.2	1.0	1.1	2.2

Source: BofA Global Research. Using monthly data from Sep-14 to Oct-20. Skew: 25bp OTM-ATM vol. We color the boxes in green (red) when the percentage of sell-offs is more than 5ppt lower (higher) than in both the unconditioned and 33-66 percentile cases.
The boxes that are bordered correspond to where the skews currently sit, percentile wise, on Nov 16th

Table 7: USD swaps: median one month basis point P&L on a receive position in the 1m forward rate, classified by percentile skew move

	unconditioned	<33	33-66	>66
2y rec	0.5	1.9	-3.1	2.6
5y rec	-1.2	-1.0	-2.9	4.7
10y rec	0.3	-2.1	1.6	6.6
30y rec	0.6	-6.8	4.3	3.7

	unconditioned	<33	33-66	>66
2y pay	0.5	3.6	-4.2	0.1
5y pay	-1.2	-1.5	-1.3	-1.0
10y pay	0.3	2.8	7.3	-2.1
30y pay	0.6	5.7	2.9	-3.9

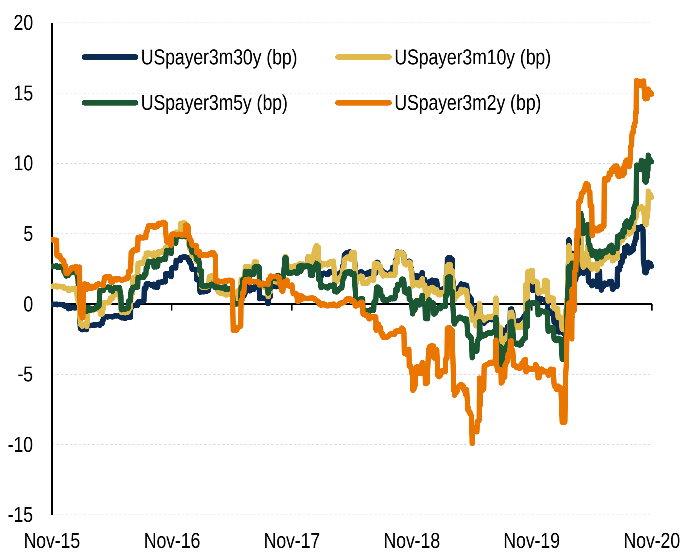
Source: BofA Global Research. Using monthly data from Sep-14 to Oct-20. Skew: 25bp OTM-ATM vol. We color the boxes in green (red) when the percentage of sell-offs is more than 5ppt lower (higher) than in both the unconditioned and 33-66 percentile cases.
The boxes that are bordered correspond to where the skews currently sit, percentile wise, on Nov 16th

Today's skew message: selloff in EUR 10s, US 10s & 30s

In the US, the last few months have seen a clear richening in payer skews (Chart 13) and cheapening in receiver skews, which currently puts the 3M changes in 3m receiver skews in the lowest third percentile across tails, and the 3M changes in 3m payers skews in the highest percentile for 2y, 5y and 10y tails (see bordered boxes in Table 5 and Table 7).

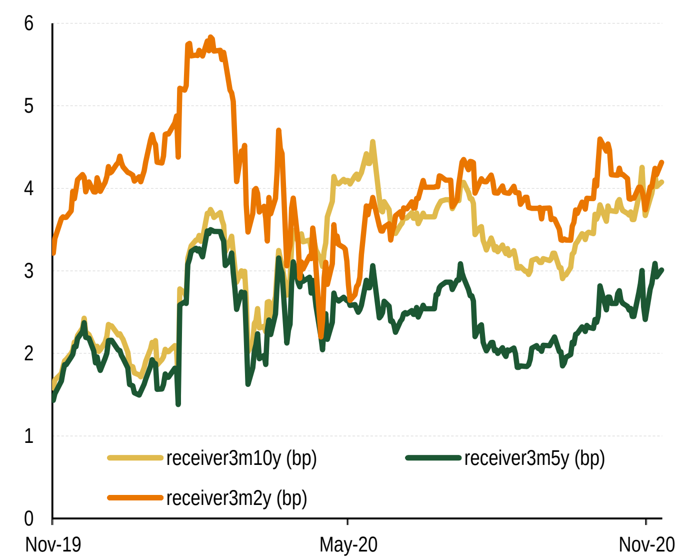
Here, the message from the analysis is clear: **we have potential for US 10y and 30y swap rates to underperform the forwards in the coming month.**

Chart 13: Significant richening of US payer skews*



Source: BofA Global Research. (*) skew here = 25bp OTM implied vol – ATM implied vol (bp/annum).

Chart 14: Some richening in EUR receiver skews* since September



Source: BofA Global Research. (*) skew here = 25bp OTM implied vol – ATM implied vol (bp/annum).

In EUR, only the 3m30y payer skew has richened significantly in the past 3 months, but for that point of the surface, the implication on rate performance hasn't historically been clear. It's receivers that have been richening meaningfully in 2-10y tails (Chart 14).

The message from this analysis is also supporting an underperformance of EUR 10y swaps relative to the forwards in the coming month. However, unlike in the US case, it is only coming from the 3m10y receiver skew at this stage (not payers, nor other tails).

Appendix (2) – US Grid dynamic

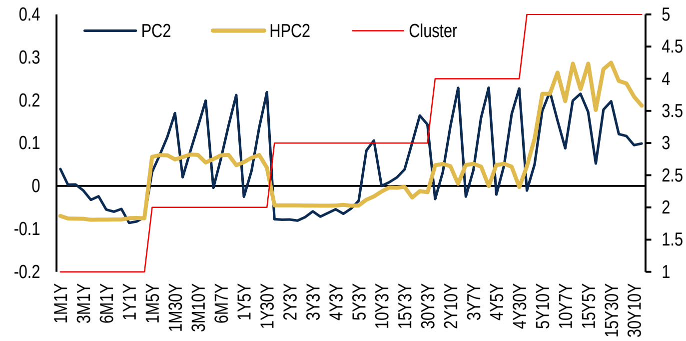
We isolate the main rotation modes of the volatility grid over the last year using both PCA and HPCA approaches (see Understanding principal components) and segregating the grid as in Table 8. The first PC is less relevant here as it is generally a parallel move on the grid, but Chart 15 shows that the second PC of the volatility grid (the most significant grid rotation over the last year) was a left vs. right side rotation. This makes sense in a context where the Fed anchored the left side of the grid with rates around the ZLB and forward guidance, and it is likely to continue to be the case in 2021 supporting the steepness of the grid across underlyings (see Chart 16)

Table 8: Grid segregation

	1Y	2Y	3Y	5Y	7Y	10Y	30Y
1M	1	1	1	2	2	2	2
3M	1	1	1	2	2	2	2
6M	1	1	1	2	2	2	2
1Y	1	1	1	2	2	2	2
2Y	3	3	3	4	4	4	4
3Y	3	3	3	4	4	4	4
4Y	3	3	3	4	4	4	4
5Y	3	3	3	5	5	5	5
10Y	3	3	3	5	5	5	5
15Y	3	3	3	5	5	5	5
30Y	3	3	3	5	5	5	5

Source: BofA Global Research

Chart 15: Second principal components of the vol grid



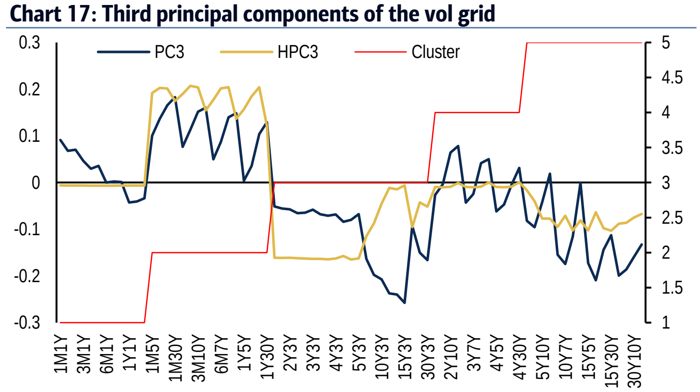
Source: BofA Global Research

The second most important rotation mode for the grid (PC3 and HPC3) over the last year was a gamma vs. intermediate and long dater expiries as we illustrate in Chart 17. There rotations were quite striking in 2020, with deep inversions of the 1y10y vs. 1m10y vol spread in the March/April turmoil, and more recently as the election event risk feel in the 1m expiries. Our expectation is that this type of rotation will continue to be significant and intermediate expiries on the right side stay supported and gamma moves in line with event risk, however, we do not expect the type of inversions we have seen in 2021 which are generally associated with extreme market turmoil or significant calendar event risk (like a US presidential election).

Chart 16: 1y10y vs 1y2y volatility spread

Source: BofA Global Research, Bloomberg

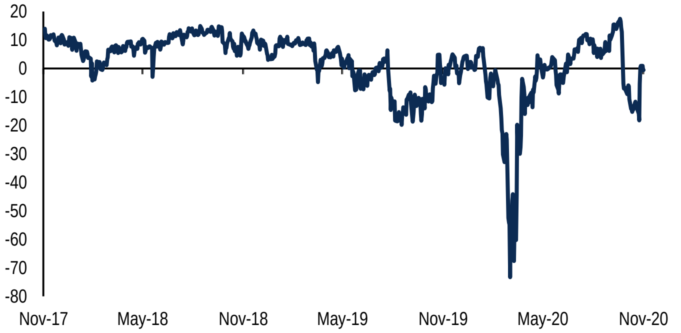
Chart 17: Third principal components of the vol grid



Source: BofA Global Research

Interestingly, and despite the intense Bermudan hedging and Formosa issuance activity in 2020, the thirst most significant rotation is between intermediates and longer dated expiries on the right side of the grid (see Table 9) as investors reflect expectations for the start of the tightening cycle (see above). Our view for higher yields and steeper curves in 2021, reflecting a scenario of economic rebound, are likely to continue to support activity in the LLC of the grid as investors reflect changing expectations for Fed liftoff.

Chart 18: 1y10y vs. 1m10y volatility spread



Source: BofA Global Research, Bloomberg

Table 9: Loading for the 4th HPCA of the vol grid

	1Y	2Y	3Y	5Y	7Y	10Y	30Y
1M	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3M	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6M	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1Y	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2Y	0.10	0.09	0.09	0.00	0.00	0.00	0.00
3Y	0.08	0.08	0.08	0.00	0.00	0.00	0.00
4Y	0.07	0.06	0.05	0.00	0.00	0.00	0.00
5Y	0.04	0.04	0.04	0.00	0.00	0.00	0.00
10Y	-0.24	-0.33	-0.27	0.00	0.00	0.00	0.00
15Y	-0.37	-0.38	-0.39	0.00	0.00	0.00	0.00
30Y	-0.19	-0.35	-0.33	0.00	0.00	0.00	0.00

Source: BofA Global Research

Analyst Certification

We, Bruno Braizinha, CFA and Sphia Salim, hereby certify that the views each of us has expressed in this research report accurately reflect each of our respective personal views about the subject securities and issuers. We also certify that no part of our respective compensation was, is, or will be, directly or indirectly, related to the specific recommendations or view expressed in this research report.

Disclosures

Important Disclosures

BofA Global Research personnel (including the analyst(s) responsible for this report) receive compensation based upon, among other factors, the overall profitability of Bank of America Corporation, including profits derived from investment banking. The analyst(s) responsible for this report may also receive compensation based upon, among other factors, the overall profitability of the Bank's sales and trading businesses relating to the class of securities or financial instruments for which such analyst is responsible.
BofA Securities fixed income analysts regularly interact with sales and trading desk personnel in connection with their research, including to ascertain pricing and liquidity in the fixed income markets.

Other Important Disclosures

Prices are indicative and for information purposes only. Except as otherwise stated in the report, for the purpose of any recommendation in relation to: (i) an equity security, the price referenced is the publicly traded price of the security as of close of business on the day prior to the date of the report or, if the report is published during intraday trading, the price referenced is indicative of the traded price as of the date and time of the report; or (ii) a debt security (including equity preferred and CDS), prices are indicative as of the date and time of the report and are from various sources including BofA Securities trading desks.
The date and time of completion of the production of any recommendation in this report shall be the date and time of dissemination of this report as recorded in the report timestamp.

This report may refer to fixed income securities or other financial instruments that may not be offered or sold in one or more states or jurisdictions, or to certain categories of investors, including retail investors. Readers of this report are advised that any discussion, recommendation or other mention of such instruments is not a solicitation or offer to transact in such instruments. Investors should contact their BofA Merrill Lynch representative or Merrill Lynch Global Wealth Management financial advisor for information relating to such instruments.
Rule 144A securities may be offered or sold only to persons in the U.S. who are Qualified Institutional Buyers within the meaning of Rule 144A under the Securities Act of 1933, as amended.
SECURITIES OR OTHER FINANCIAL INSTRUMENTS DISCUSSED HEREIN MAY BE RATED BELOW INVESTMENT GRADE AND SHOULD THEREFORE ONLY BE CONSIDERED FOR INCLUSION IN ACCOUNTS QUALIFIED FOR SPECULATIVE INVESTMENT.
Recipients who are not institutional investors or market professionals should seek the advice of their independent financial advisor before considering information in this report in connection with any investment decision, or for a necessary explanation of its contents.
The securities or other financial instruments discussed in this report may be traded over-the-counter. Retail sales and/or distribution of this report may be made only in states where these instruments are exempt from registration or have been qualified for sale.
Officers of BofAS or one or more of its affiliates (other than research analysts) may have a financial interest in securities of the issuer(s) or in related investments.
This report, and the securities or other financial instruments discussed herein, may not be eligible for distribution or sale in all countries or to certain categories of investors, including retail investors.
BofA Global Research policies relating to conflicts of interest are described at https://rsch.baml.com/coi
"BofA Securities" includes BofA Securities, Inc. ("BofAS") and its affiliates. Investors should contact their BofA Securities representative or Merrill Global Wealth Management financial advisor if they have questions concerning this report or concerning the appropriateness of any investment idea described herein for such investor. "BofA Securities" is a global brand for BofA Global Research.
Information relating to Non-US affiliates of BofA Securities and Distribution of Affiliate Research Reports:
BofAS and/or Merrill Lynch, Pierce, Fenner & Smith ("MLPF&S") may in the future distribute, information of the following non-US affiliates in the US (short name: legal name, regulator): Merrill Lynch (South Africa): Merrill Lynch South Africa (Pty) Ltd., regulated by The Financial Service Board; MLI (UK): Merrill Lynch International, regulated by the Financial Conduct Authority (FCA) and the Prudential Regulation Authority (PRA); BofASE (France): BofA Securities Europe SA is authorized by the Autorité de Contrôle Prudentiel et de Résolution (ACPR) and regulated by the ACPR and the Autorité des Marchés Financiers (AMF); BofA Europe (Milan): Bank of America Europe Designated Activity Company, Milan Branch, regulated by the Bank of Italy, the European Central Bank (ECB) and the Central Bank of Ireland (CBI); BofA Europe (Frankfurt): Bank of America Europe Designated Activity Company, Frankfurt Branch regulated by BaFin, the ECB and the CBI; Merrill Lynch (Australia): Merrill Lynch Equities (Australia) Limited, regulated by the Australian Securities and Investments Commission; Merrill Lynch (Hong Kong): Merrill Lynch (Asia Pacific) Limited, regulated by the Hong Kong Securities and Futures Commission (HKSFC); Merrill Lynch (Singapore): Merrill Lynch (Singapore) Pte Ltd, regulated by the Monetary Authority of Singapore (MAS); Merrill Lynch (Canada): Merrill Lynch Canada Inc, regulated by the Investment Industry Regulatory Organization of Canada; Merrill Lynch (Mexico): Merrill Lynch Mexico, SA de CV, Casa de Bolsa, regulated by the Comisión Nacional Bancaria y de Valores; Merrill Lynch (Argentina): Merrill Lynch Argentina SA, regulated by Comisión Nacional de Valores; BofAS Japan: BofA Securities Japan Co., Ltd., regulated by the Financial Services Agency; Merrill Lynch (Seoul): Merrill Lynch International, LLC Seoul Branch, regulated by the Financial Supervisory Service; Merrill Lynch (Taiwan): Merrill Lynch Securities (Taiwan) Ltd., regulated by the Securities and Futures Bureau; BofAS India: BofA Securities India Limited, regulated by the Securities and Exchange Board of India (SEBI); Merrill Lynch (Indonesia): PT Merrill Lynch Sekuritas Indonesia, regulated by Otoritas Jasa Keuangan (OJK); Merrill Lynch (Israel): Merrill Lynch Israel Limited, regulated by Israel Securities Authority; Merrill Lynch (Russia): OOO Merrill Lynch Securities, Moscow, regulated by the Central Bank of the Russian Federation; Merrill Lynch (DIFC): Merrill Lynch International (DIFC Branch), regulated by the Dubai Financial Services Authority (DFSA); Merrill Lynch (Spain): Merrill Lynch Capital Markets Espana, S.A.S.V., regulated by Comisión Nacional del Mercado De Valores; Merrill Lynch (Brazil): Merrill Lynch S.A. Corretora de Títulos e Valores Mobiliários, regulated by Comissão de Valores Mobiliários; Merrill Lynch KSA Company: Merrill Lynch Kingdom of Saudi Arabia Company, regulated by the Capital Market Authority.
This information: has been approved for publication and is distributed in the United Kingdom (UK) to professional clients and eligible counterparties (as each is defined in the rules of the FCA and the PRA) by MLI (UK), which is authorized by the PRA and regulated by the FCA and the PRA - details about the extent of our regulation by the FCA and PRA are available from us on request; has been approved for publication and is distributed in the European Economic Area (EEA) by BofASE (France), which is authorized by the ACPR and regulated by the ACPR and the AMF; has been considered and distributed in Japan by BofAS Japan, a registered securities dealer under the Financial Instruments and Exchange Act in Japan, or its permitted affiliates; is issued and distributed in Hong Kong by Merrill Lynch (Hong Kong) which is regulated by HKSFC; is issued and distributed in Taiwan by Merrill Lynch (Taiwan); is issued and distributed in India by BofAS India; and is issued and distributed in Singapore to institutional investors and/or accredited investors (each as defined under the Financial Advisers Regulations) by Merrill Lynch (Singapore) (Company Registration No 198602883D). Merrill Lynch (Singapore) is regulated by MAS. Merrill Lynch Equities (Australia) Limited (ABN 65 006 276 795), AFS License 235132 (MLEA) distributes this information in Australia only to 'Wholesale' clients as defined by s.761G of the Corporations Act 2001. With the exception of Bank of America N.A., Australia Branch, neither MLEA nor any of its affiliates involved in preparing this information is an Authorised Deposit-Taking Institution under the Banking Act 1959 nor regulated by the Australian Prudential Regulation Authority. No approval is required for publication or distribution of this information in Brazil and its local distribution is by Merrill Lynch (Brazil) in accordance with applicable regulations. Merrill Lynch (DIFC) is authorized and regulated by the DFSA. Information prepared and issued by Merrill Lynch (DIFC) is done so in accordance with the requirements of the DFSA conduct of business rules. BofA Europe (Frankfurt) distributes this information in Germany and is regulated by BaFin, the ECB and the CBI. BofA Securities entities, including BofA Europe and BofASE (France), may outsource/delegate the marketing and/or provision of certain research services or aspects of research services to other branches or members of the BofA Securities group. You may be contacted by a different BofA Securities entity acting for and on behalf of your service provider where permitted by applicable law. This does not change your service provider. Please use this link http://www.bankofamerica.com/emaildisclaimer for further information
This information has been prepared and issued by BofAS and/or one or more of its non-US affiliates. The author(s) of this information may not be licensed to carry on regulated activities in your jurisdiction and, if not licensed, do not hold themselves out as being able to do so. BofAS and/or MLPF&S is the distributor of this information in the US and accepts full responsibility for information distributed to BofAS and/or MLPF&S clients in the US by its non-US affiliates. Any US person receiving this information and wishing to effect any transaction in any security discussed herein should do so through BofAS and/or MLPF&S and not such foreign affiliates. Hong Kong recipients of this information should contact Merrill Lynch (Asia Pacific) Limited in respect of any matters relating to dealing in securities or provision of specific advice on securities or any other matters arising from, or in connection with, this information. Singapore recipients

of this information should contact Merrill Lynch (Singapore) Pte Ltd in respect of any matters arising from, or in connection with, this information.

General Investment Related Disclosures:

Taiwan Readers: Neither the information nor any opinion expressed herein constitutes an offer or a solicitation of an offer to transact in any securities or other financial instrument. No part of this report may be used or reproduced or quoted in any manner whatsoever in Taiwan by the press or any other person without the express written consent of BofA Securities.

This document provides general information only, and has been prepared for, and is intended for general distribution to, BofA Securities clients. Neither the information nor any opinion expressed constitutes an offer or an invitation to make an offer, to buy or sell any securities or other financial instrument or any derivative related to such securities or instruments (e.g., options, futures, warrants, and contracts for differences). This document is not intended to provide personal investment advice and it does not take into account the specific investment objectives, financial situation and the particular needs of, and is not directed to, any specific person(s). This document and its content do not constitute, and should not be considered to constitute, investment advice for purposes of ERISA, the US tax code, the Investment Advisers Act or otherwise. Investors should seek financial advice regarding the appropriateness of investing in financial instruments and implementing investment strategies discussed or recommended in this document and should understand that statements regarding future prospects may not be realized. Any decision to purchase or subscribe for securities in any offering must be based solely on existing public information on such security or the information in the prospectus or other offering document issued in connection with such offering, and not on this document.

Securities and other financial instruments referred to herein, or recommended, offered or sold by BofA Securities, are not insured by the Federal Deposit Insurance Corporation and are not deposits or other obligations of any insured depository institution (including, Bank of America, N.A.). Investments in general and, derivatives, in particular, involve numerous risks, including, among others, market risk, counterparty default risk and liquidity risk. No security, financial instrument or derivative is suitable for all investors. In some cases, securities and other financial instruments may be difficult to value or sell and reliable information about the value or risks related to the security or financial instrument may be difficult to obtain. Investors should note that income from such securities and other financial instruments, if any, may fluctuate and that price or value of such securities and instruments may rise or fall and, in some cases, investors may lose their entire principal investment. Past performance is not necessarily a guide to future performance. Levels and basis for taxation may change.

BofA Securities is aware that the implementation of the ideas expressed in this report may depend upon an investor's ability to "short" securities or other financial instruments and that such action may be limited by regulations prohibiting or restricting "shortselling" in many jurisdictions. Investors are urged to seek advice regarding the applicability of such regulations prior to executing any short idea contained in this report.

This report may contain a trading idea or recommendation which highlights a specific identified near-term catalyst or event impacting a security, issuer, industry sector or the market generally that presents a transaction opportunity, but does not have any impact on the analyst's particular "Overweight" or "Underweight" rating (which is based on a three month trade horizon). Trading ideas and recommendations may differ directionally from the analyst's rating on a security or issuer because they reflect the impact of a near-term catalyst or event.

Foreign currency rates of exchange may adversely affect the value, price or income of any security or financial instrument mentioned in this report. Investors in such securities and instruments effectively assume currency risk.

UK Readers: The protections provided by the U.K. regulatory regime, including the Financial Services Scheme, do not apply in general to business coordinated by BofA Securities entities located outside of the United Kingdom.

BofAS or one of its affiliates is a regular issuer of traded financial instruments linked to securities that may have been recommended in this report. BofAS or one of its affiliates may, at any time, hold a trading position (long or short) in the securities and financial instruments discussed in this report.

BofA Securities, through business units other than BofA Global Research, may have issued and may in the future issue trading ideas or recommendations that are inconsistent with, and reach different conclusions from, the information presented herein. Such ideas or recommendations may reflect different time frames, assumptions, views and analytical methods of the persons who prepared them, and BofA Securities is under no obligation to ensure that such other trading ideas or recommendations are brought to the attention of any recipient of this information.

In the event that the recipient received this information pursuant to a contract between the recipient and BofAS for the provision of research services for a separate fee, and in connection therewith BofAS may be deemed to be acting as an investment adviser, such status relates, if at all, solely to the person with whom BofAS has contracted directly and does not extend beyond the delivery of this report (unless otherwise agreed specifically in writing by BofAS If such recipient uses the services of BofAS in connection with the sale or purchase of a security referred to herein, BofAS may act as principal for its own account or as agent for another person. BofAS is and continues to act solely as a broker-dealer in connection with the execution of any transactions, including transactions in any securities referred to herein.

Copyright and General Information:

Materials prepared by BofA Global Research personnel are based on public information. Facts and views presented in this material have not been reviewed by, and may not reflect information known to, professionals in other business areas of BofA Securities, including investment banking personnel. BofA Securities has established information barriers between BofA Global Research and certain business groups. As a result, BofA Securities does not disclose certain client relationships with, or compensation received from, such issuers. To the extent this material discusses any legal proceeding or issues, it has not been prepared as nor is it intended to express any legal conclusion, opinion or advice. Investors should consult their own legal advisers as to issues of law relating to the subject matter of this material. BofA Global Research personnel's knowledge of legal proceedings in which any BofA Securities entity and/or its directors, officers and employees may be plaintiffs, defendants, co-defendants or co-plaintiffs with or involving issuers mentioned in this material is based on public information. Facts and views presented in this material that relate to any such proceedings have not been reviewed by, discussed with, and may not reflect information known to, professionals in other business areas of BofA Securities in connection with the legal proceedings or matters relevant to such proceedings.

This information has been prepared independently of any issuer of securities mentioned herein and not in connection with any proposed offering of securities or as agent of any issuer of any securities. None of BofAS any of its affiliates or their research analysts has any authority whatsoever to make any representation or warranty on behalf of the issuer(s). BofA Global Research policy prohibits research personnel from disclosing a recommendation, investment rating, or investment thesis for review by an issuer prior to the publication of a research report containing such rating, recommendation or investment thesis.

Any information relating to the tax status of financial instruments discussed herein is not intended to provide tax advice or to be used by anyone to provide tax advice. Investors are urged to seek tax advice based on their particular circumstances from an independent tax professional.

The information herein (other than disclosure information relating to BofA Securities and its affiliates) was obtained from various sources and we do not guarantee its accuracy. This information may contain links to third-party websites. BofA Securities is not responsible for the content of any third-party website or any linked content contained in a third-party website. Content contained on such third-party websites is not part of this information and is not incorporated by reference. The inclusion of a link does not imply any endorsement by or any affiliation with BofA Securities. Access to any third-party website is at your own risk, and you should always review the terms and privacy policies at third-party websites before submitting any personal information to them. BofA Securities is not responsible for such terms and privacy policies and expressly disclaims any liability for them.

All opinions, projections and estimates constitute the judgment of the author as of the date of publication and are subject to change without notice. Prices also are subject to change without notice. BofA Securities is under no obligation to update this information and BofA Securities ability to publish information on the subject issuer(s) in the future is subject to applicable quiet periods. You should therefore assume that BofA Securities will not update any fact, circumstance or opinion contained herein.

Certain outstanding reports or investment opinions relating to securities, financial instruments and/or issuers may no longer be current. Always refer to the most recent research report relating to an issuer prior to making an investment decision.

In some cases, an issuer may be classified as Restricted or may be Under Review or Extended Review. In each case, investors should consider any investment opinion relating to such issuer (or its security and/or financial instruments) to be suspended or withdrawn and should not rely on the analyses and investment opinion(s) pertaining to such issuer (or its securities and/or financial instruments) nor should the analyses or opinion(s) be considered a solicitation of any kind. Sales persons and financial advisors affiliated with BofAS or any of its affiliates may not solicit purchases of securities or financial instruments that are Restricted or Under Review and may only solicit securities under Extended Review in accordance with firm policies.

Neither BofA Securities nor any officer or employee of BofA Securities accepts any liability whatsoever for any direct, indirect or consequential damages or losses arising from any use of this information.