US Rates Watch

Monthly rates models: Dec '23 edition

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Rates Research
United States

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December rates models update

We update some of the rates models we use to gauge risk bias, positioning, and relative value across duration, curve, real yields, breakevens, and front-end spreads. Our models suggest that nominals mean reverted to fundamentals from materially cheap levels. Real yields look rich and breakevens wide. SOFR is likely to slowly trend upward going forward, leading to tightening in the SOFR/FF basis. Portfolios stayed broadly risk on over November, and with a bias towards carry.

Duration & curve

Fair value for 10yT is c.4.25-4.4% currently, that is c.25-30bp higher over the last couple of months. 10yT yields trade slightly rich to fair values, reflecting expectations for a slight downgrade of the macro backdrop over the next 3-6 months. The curve dynamic has shifted over the last month, with a higher frequency of steepening moves recently in both 2s10s and 5s30s. Dynamic reflects c.3-3.25% neutral rate expectations.

Breakevens, TIPS & real yields

10y breakevens trade c.25bp wide vs fundamentals. BE dynamic suggests expectations for a recoupling of inflation and growth fundamentals. 10y real yields are c.25bp rich versus our macro framework. The BE dynamic suggests 57% likelihood of resilience + reacceleration vs 43% odds assigned to lower growth scenarios.

Front end

We update our forecasts for SOFR/FF basis by equally weighting 3 regression outputs from 3 liquidity periods: (1) Q3'20-Q1'21= ON RRP take-up < \$200b, (2) Q2'21-Q2'23 = ON RRP take-up > \$200b, (3) Q3 '23 to today = recent period of rapid ON RRP decline.

Allocations

Gauges of risk appetite show risk-on bias, albeit with a slight downgrade over the last month (e.g., from 65% in Oct to 60% currently in our futures positioning monitor). Bias for carry seems to persist to some extent.

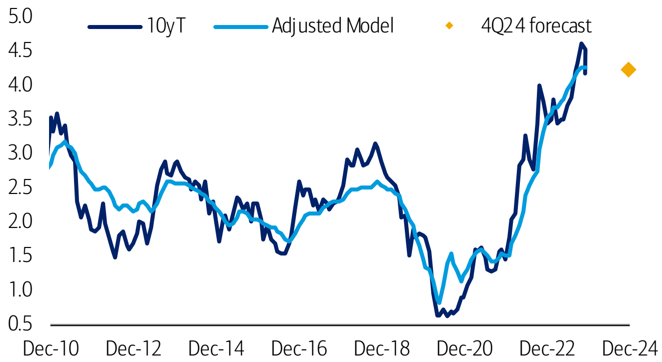
Glossary

10y – 10-year
10yT – 10-year Treasury
BE – Breakeven
c. – circa
DM – Developed Markets
EM – Emerging Markets
EFFR – Effective Federal Funds Rate
ETF – Exchange Traded Funds
FF – Fed funds
GDP – Gross Domestic Product
IORB – Interest Rate on Reserve Balances
LC – Large Cap
ON RRP – Overnight Reverse Repo facility
PCA – Principal Component Analysis
QT – Quantitative Tightening
RV – Relative Value
SC – Small Cap
SOFR – Secured Overnight Financing Rate
VAR – Vector Auto-Regressive

Duration

Macro model

Exhibit 1: 10yT macro fair value
10yT fair value consistent with current fundamentals c.4.25%



Source: BofA Global Research; Bloomberg

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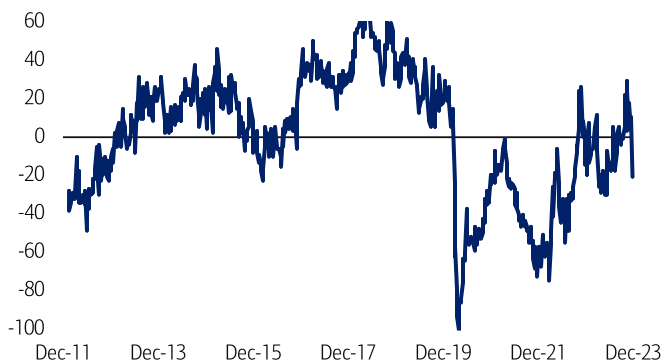
Our macro framework suggests that the 10yT fair value consistent with current US fundamentals is c.4.25%. This is roughly 25bp higher over the last couple of months (see the report, Monthly rates models: Sep '23 edition).

Treasury yields trade fair to slightly rich vs fundamentals, after an excursion away from fair values where we saw up to 75bp of cheapness at the peak in mid-October.

Global yield framework

Exhibit 2: Residual of 10yT Global yield model
10yT fair value consistent with current global yields c.4.40%



Source: BofA Global Research

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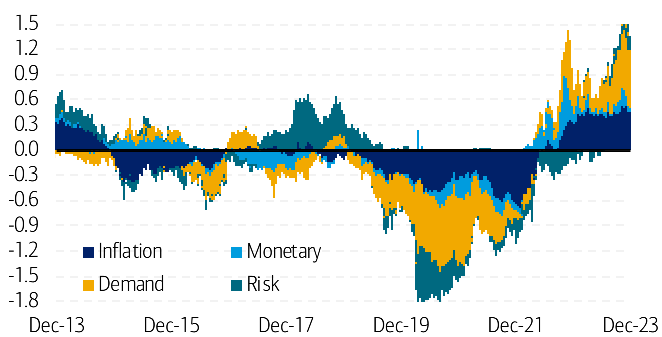
10yT fair value consistent with global yields is c.4.40%. This is c.30bp higher over the last couple of months.

The late-cycle bias should be for USTs to trade fair to rich to global yields. A more significant 10yT selloff beyond fair value levels would therefore likely need to be supported by a broader bearish momentum in global yields.

The 10yT yields are trading c.20-25bp rich relative to global yields.

Decomposition of the 10yT dynamic

Exhibit 3: Decomposition of the 10yT dynamic
Monetary policy c.0bp, Risk c.10bp; Inflation c.35bp & Demand c.65bp



Source: BofA Global Research

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Steady state is up from c.2% in early 2022 to 2.7% currently, suggesting an upgrade of the neutral rate view. We expect it to increase further towards c.2.75-3%

Current shocks:

- Monetary policy c.0bp, -10bp over the last month
- Risk c.10bp; steady over the last couple of months
- Inflation c.35bp, -20bp over the last month
- Demand c.65bp, -5bp over the last couple of months.

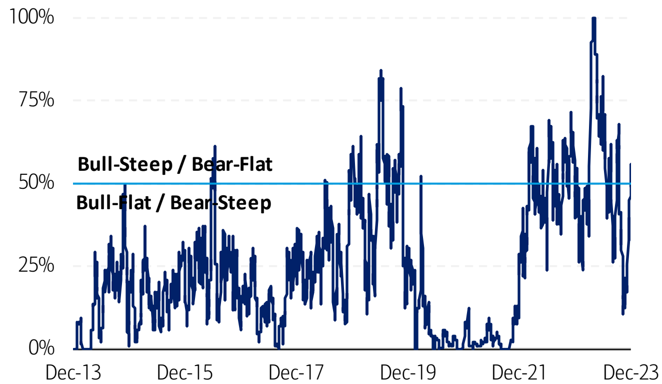
The moves reflect fading of inflation and hawkish monetary policy shocks. and some upgrade of demand. Risk backdrop has stayed steady.

Curve

Curve directionality

Exhibit 4: 2s10s directionality Index

Dynamic evenly split between 2y and 10y driven over the last month



Source: BofA Global Research

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Front-end drives 64% of the 2s10s curve dynamic over the last two weeks, up from 49% over the last month.

Curve directionality has shifting to bull steepening over the last two weeks.

Exhibit 5: Decomposition of the 2s10s dynamic

Belly underperforming versus wings over the last 2 weeks

	bull-Steep	bear-Flat	bull-Flat	bear-Steep
2w	44%	20%	18%	18%
1m	24%	25%	34%	16%
2m	14%	15%	38%	32%
3m	15%	15%	30%	40%

Source: BofA Global Research

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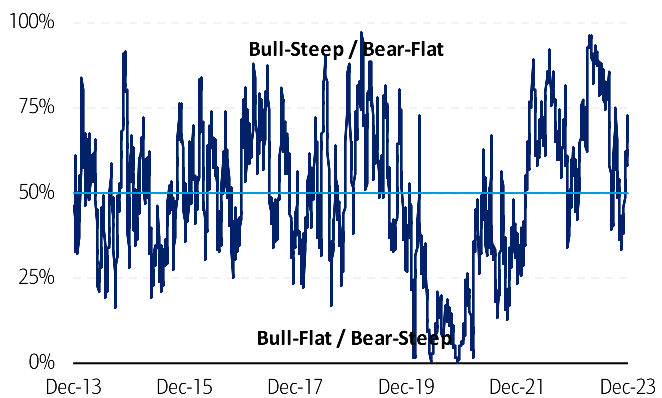
Exhibit 6: 5s30s directionality Index

Frequency of bull steepening moves increased at backend



Source: BofA Global Research

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Belly drives 84% of the 5s30s curve dynamic over the last two weeks, up from 65% over the last month. The bias is still for the belly to outperform, with an increase of bull steepening frequencies.

Exhibit 7: Decomposition of the 5s30s dynamic

Belly continues to lead the dynamic

5Y/30Y	bull-Steep	bear-Flat	bull-Flat	bear-Steep
2w	50%	34%	14%	2%
1m	42%	23%	32%	3%
2m	34%	18%	34%	15%
1m	32%	19%	27%	22%

Source: BofA Global Research

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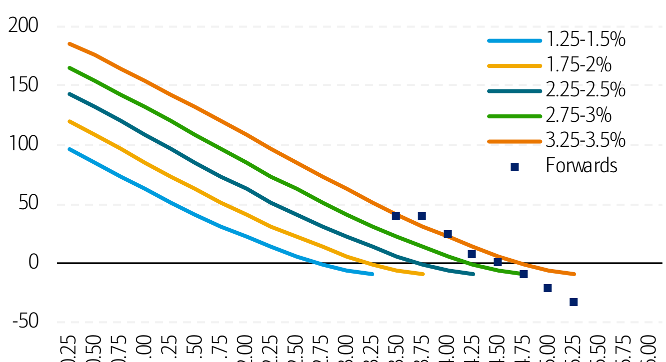
Flattening dynamic in the cycle vs neutral rate view

Exhibit 8: 2s10s bull steepening dynamic vs neutral rate view

Curve levels (y-axis) vs fed funds (x-axis) ... curve forwards consistent with neutral rate expectations c.3%



Source: BofA Global Research

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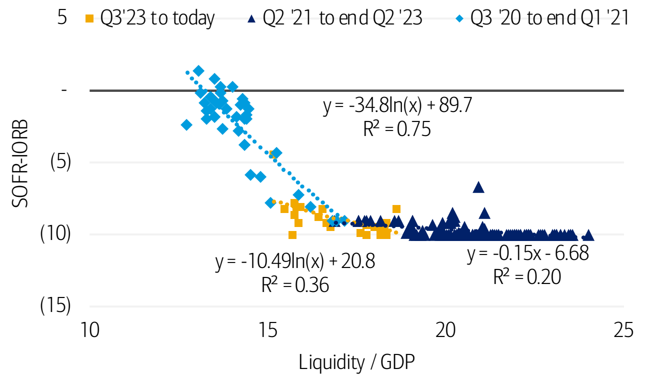
The 2s10s bull steepening trajectory priced in curve forwards vs 3m OIS fwds seems to be consistent with a neutral rate assumption around 3-3.25%.

Front end

SOFR/FF basis

Exhibit 9: SOFR-IORB spread versus Liquidity / GDP

As liquidity has declined, SOFR has begun to print higher in the range



Source: BofA Global Research, Bloomberg, Federal Reserve

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We have updated our regression forecast for SOFR-IORB spread using a log linear regression of ON RRP + Fed Reserves (Fed liquidity) over GDP. We break out the regression into three periods, (1) Q3'20-Q1'21: ON RRP take-up < \$200b, (2) Q2'21-Q2'23: ON RRP take-up > \$200b, (3) Q3 '23 to today: recent period of rapid ON RRP decline.

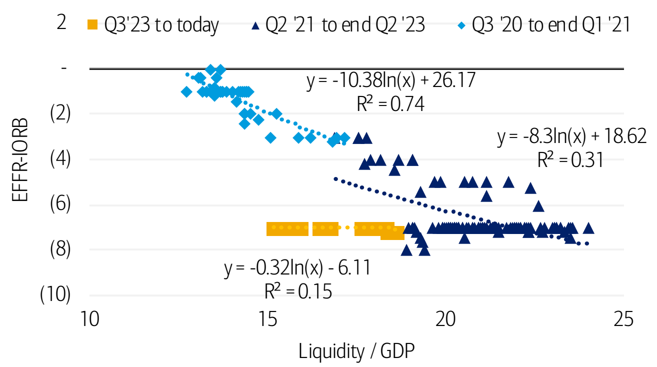
We have begun to see SOFR print higher as liquidity has drained via QT. Until recently, declines in the TGA were offsetting the impact of QT on Fed liquidity, which left SOFR relatively steady.

Since Q3 '23 however, we have begun to see QT plus the TGA refill begin to drain liquidity much more rapidly which has led to upward pressure in SOFR.

We expect to see liquidity continue to decline going forward, which should continue to put upward pressure on SOFR.

Exhibit 10: EFFR-IORB spread vs Liquidity / GDP

EFFR has been sticky despite liquidity drain



Source: BofA Global Research, Bloomberg, Federal Reserve

BofA GLOBAL RESEARCH

We also update our regression forecast for EFFR-IORB spread using a log linear regression of ON RRP + Fed Reserves (Fed liquidity) over GDP. We break out the regression into three periods, Q3'20-Q1'21: ON RRP take-up < \$200b, Q2'21-Q2'23: ON RRP take-up > \$200b, and Q3 '23 to today: recent period of rapid ON RRP decline.

We find that EFFR has been sticky at 7bps below IORB despite the rapid reduction in Fed liquidity since June.

Upward pressure in the EFFR percentiles has also dissipated, implying that EFFR is likely to be steady here for the time being.

Going forward we expect EFFR to move upward in the range but lagged to SOFR

Exhibit 11: Regression outputs for FF-SOFR spread (bps)

Using equal weights for 3 regression periods we forecast SOFR/FF basis tightening

Date	SOFR-IORB	EFFR-IORB	FF-SOFR
Dec-2023	-6	-7	-1
Mar-2024	-5	-7	-2
Jun-2024	-4	-6	-2
Sep-2024	-3	-6	-3
Dec-2024	-3	-6	-3
Mar-2025	-4	-6	-2
Jun-2025	-4	-6	-2
Sep-2025	-2	-5	-3
Dec-2025	0	-5	-5

Source: BofA Global Research, Bloomberg, Federal Reserve

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To calculate our regression output, we equally weight the 3 regression periods (1) Q3' 20 – Q1 '21, (2) Q2 '21 – Q2 '23, (3) Q3 '23 to today.

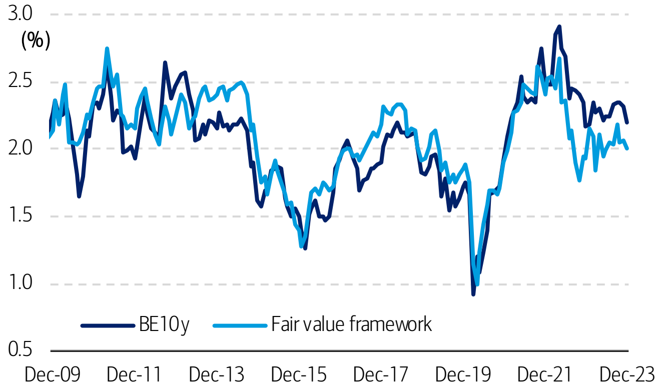
As a result, our forecast shows EFFR as stickier than SOFR, which is likely to drift higher.

The SOFR-FF basis is likely to tighten with risk of widening in 1H of 2025 due to TGA drain from debt limit dynamics.

TIPS

Macro framework for breakevens (BEs)

Exhibit 12: Macro framework for 10y BE
10y BE fair value c.200bp, market trading wide versus fundamentals



Source: BofA Global Research; Bloomberg

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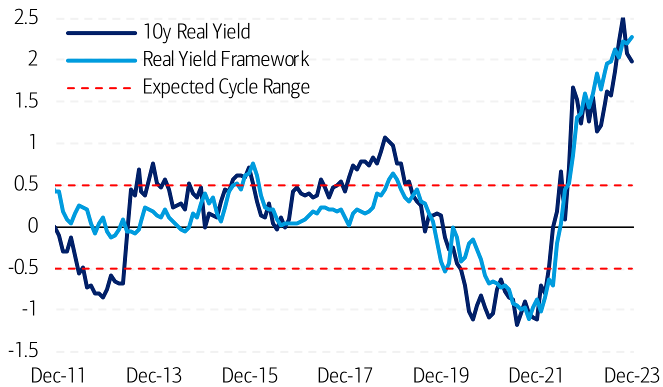
We model 10y BE as a function of inflation expectations, inflation risk premium, and inflation liquidity premium components.

US 10y breakevens fair value is c.200bp, roughly 25bp lower over the last couple of months. Market trading wide versus fundamentals.

Real yield (10y BE vs 10y nominal model)

Exhibit 13: 10y real yield framework
Fair value for 10y real yields in macro framework c.225bp



Source: BofA Global Research

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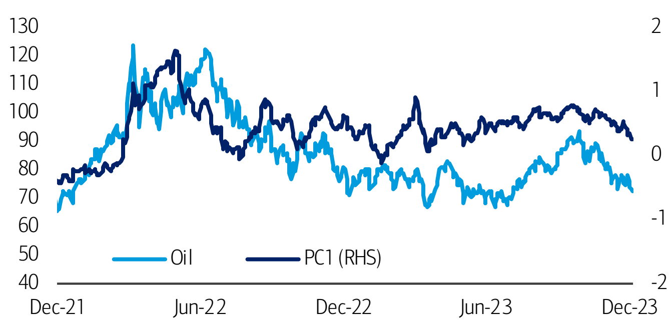
US 10y real rate fair value is c.225bp, up 50bp over the last couple of months. The market is trading 10y real yields 25bp rich to the fair value level suggested by our macro framework.

PCA on global 10y BEs

Exhibit 14: First breakeven trends well with 1st crude oil futures
Oil remains a key driver for global inflation expectations but shows sign of decoupling in recent months



Source: BofA Global Research

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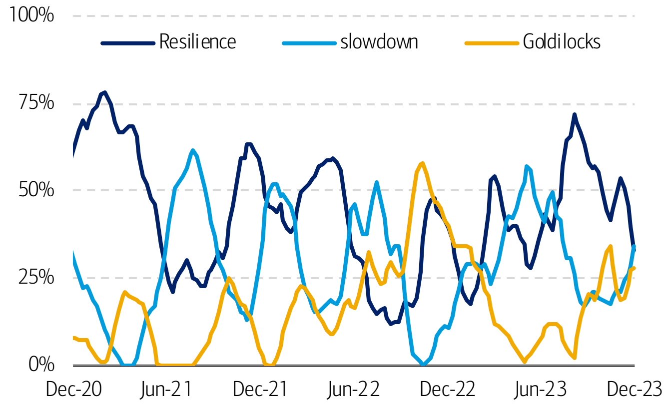
Our 1st principal component (PC) of global 10y BEs saw further decoupling from oil. R-squared is 53% vs 56% in October.

Oil has been one of the main factors driving global inflation expectations, but recent decoupling trend may reflect increased sensitivity of global 10y BEs to central banks' actions.

Directionality of 10y BEs

Exhibit 15: Probability of slowdown vs resilience and goldilocks scenarios (2m average frequencies)

Slowdown odds (hard landing + soft landing scenarios) relatively even vs resilience (steady resilience + reacceleration) for the first time since mid-July



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10y BEs are showing a more standard directionality. Orthodox moves (bull tightening and bear widening) continue to dominate the dynamic (c.68%%) but with frequencies slightly below the historical ones. This suggests market expectations for a higher correlation and causality between growth and inflation in 2023.

Slowdown odds (bull tightening moves) increased over resilience (bear widening) over the last month.

Exhibit 16: 10y Breakeven directionality

Bull tightening and bear widening driving the 10yBE dynamic again

	bull-Tight	bear-Wide	bull-Wide	bear-Tight
Current	39%	29%	5%	28%
1m	34%	33%	5%	28%
2m	27%	43%	6%	23%
3m	24%	44%	6%	26%

Source: BofA Global Research

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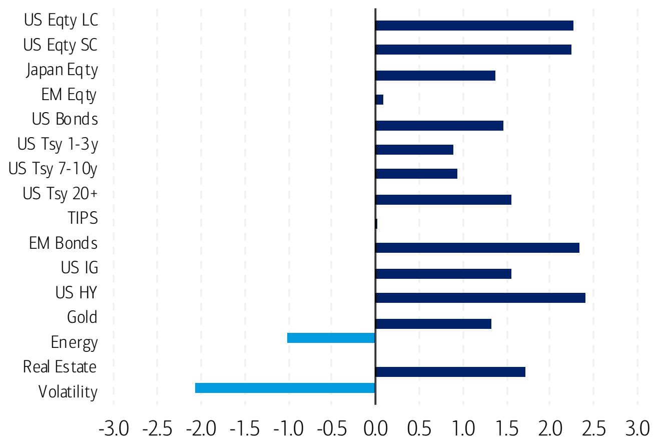
Asset allocation

Flows and allocation bias

Exhibit 17: Gauge of risk profile obtained from ETF flows
Profile suggests fading of risk on bias but some bias still for a carry



Source: BofA Global Research

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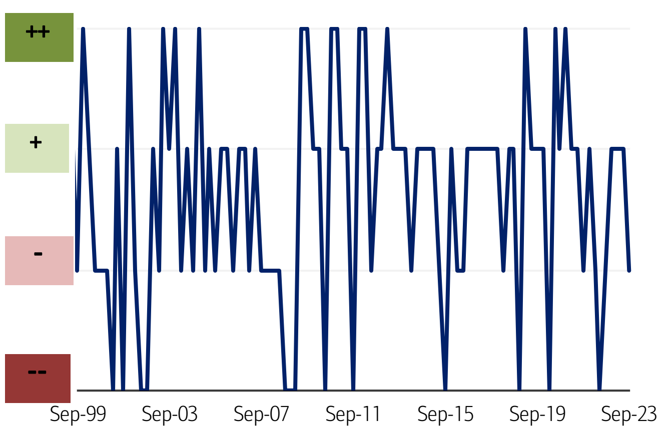
Gauge of risk profile and allocations obtained from ETF flows suggests risk on bias:

- Bonds – Long bias across the UST curve (more significant at the backend), marginally long TIPS, long EM bond.
- Equities – Long US LC & SC, Japan, and small long in EM.
- Credit – Long IG & HY
- Alternatives – Long gold and Real estate & short Energy
- Volatility – Short equity volatility suggesting a bias towards carry.

Exhibit 18: Regimes for quarterly performance across asset classes
US market dynamic in 3Q23 was closer to a moderate risk-off regime



Source: BofA Global Research

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Historical transition probabilities suggest: (1) c.20% odds of a shift to risk off (hard landing); (2) c.25% odds a persistence of a moderate risk-off dynamic; (3) c.45% odds of a shift to moderate risk-on; and (4) c.10-15% of risk-on (reacceleration).

Our economist's scenario is more biased towards scenarios 1+2 (c.20-25% + c.35%) vs. scenarios 3+4 (c.30% + c.10-15%).

Exhibit 19: Transition probabilities between different states for the US market dynamic
From moderate risk-off the highest transition probabilities are either into a moderate risk-on state (46%) or staying in moderate risk-off (23%)

	--	-	+	++
--	21%	7%	21%	**50%**
-	**19%**	**23%**	**46%**	**12%**
+	13%	33%	**46%**	9%
++	0%	26%	**53%**	21%

Source: BofA Global Research

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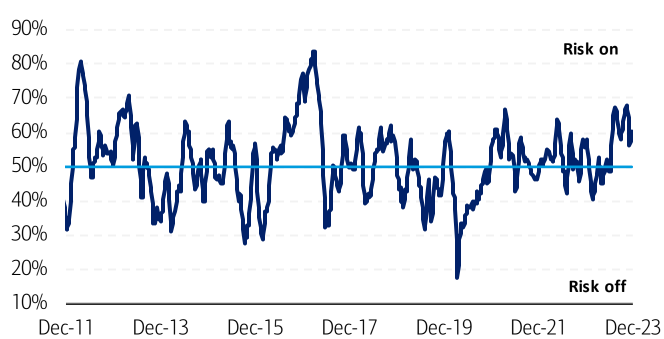
Exhibit 20: Positioning bias extracted from futures across assets
Risk-on bias faded only slightly over November



Source: BofA Global Research

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Positioning bias extracted from futures across asset classes suggests the persistence of a risk on bias in November c.60%, a slight downgrade from 65% in October.

Appendix: Model descriptions

Macro model

In our macro framework for the dynamic of Treasuries, we calculate the first two PCs of the rates curve (2s, 5s, 10s and 30s), and regress each of these on Fed funds (to define cycle dynamic) and the principal components of growth variables, inflation variables, and employment variables (see our report, A hitchhikers guide to RV on the UST curve).

Macro models are calibrated over long historical windows, generally longer than the average cycle length (somewhere between 7 years and 15 years) to capture the broader dynamic of Treasuries throughout the cycle. Significantly, these models tend to break down in periods of significant non-economic buying of Treasuries. We have seen several of these periods over the last couple of cycles, for example the following:

- The Greenspan conundrum, when we saw the back end of the Treasury curve rallying even as the Fed hiked rates in the early stages of the 2004-06 tightening cycle, driven foreign central bank buying.
- Quantitative easing (QE) periods, when the Fed acts as a non-economic buyer. Indeed, in general, these periods drive a negative correlation between growth and yields, and it is a challenge to avoid solutions that converge to these sorts of non-economic betas in macro frameworks for the dynamic of yields
- Global yield demand in a context of very low global yields. Indeed, global demand for USTs may be driven less by US fundamentals but more by yield differentials to other DM yields and the cost of hedging the FX exposure

To account for the pressures on the Treasury curve from these non-economic distortions, we include in our independent data set the dynamic of the Fed balance sheet and the first principal component of global DM rates. In our framework, therefore, we converge to two solutions: one whereby we express fair value consistent with US macro fundamentals alone and an adjusted framework whereby we incorporate the impact of overseas demand on the Treasury curve.

Global yield framework

This framework is an alternative approach to PCA, which addresses the shortcoming of PCA not being able to capture trends in the data to a large extent. The framework can achieve this by capturing the shared covariances in the dataset through hidden state processes and also allows for the modeling of the time-varying dynamic of these factors explicitly. In a relatively simple specification, a number of factors (determined a-priori) are defined through a given state equation:

$$x(t) = B * x(t - 1) + w(t)$$

while the independent variables are modeled as a function of these factors:

$$y(t) = Z * x(t) + v(t)$$

where:

$$w(t) \sim MVN(0, Q)\ ,\ \ v(t) \sim MVN(0, R)\ ,\ x(0) \sim MVN(X0, V0)$$

The factors (*x's*) are calibrated to explain the dynamic of the independent variables (*y's*) through the linear combinations defined by the calibrated projection matrix (*Z*). The projection matrix Z can be constrained to add more intuition to the interpretability of the factors.

Decomposition of the 10yT dynamic

In statistics, the traditional frequentist approach assumes that each parameter has a "true" value, and the goal is to find a close estimate to that (fixed) value. In contrast, the Bayesian approach views each parameter as a random variable, characterized by some underlying probabilistic distribution, along with constraints on the relative dynamic of the different parameters. The latter allows the analyst to avoid non-economic solutions, for example models where Treasury yields are negatively correlated with growth.

The vector auto-regressive framework is used to capture the relationship between multiple time series as they evolve over time, versus lagged levels. A *p*th-order VAR refers to a VAR model with a time lag for the last *p* time periods and is denoted VAR(*p*). This can be expressed as follows:

$$y(t) = a0 + A1 * y(t-1) + \ldots + Ap * y(t-p) + \varepsilon(t) \text{ with } \varepsilon(t) \sim N(0,\Sigma)$$

Where $y(t)$ is the $M \times 1$ vector of endogenous variables, $a0$ is the $M \times 1$ vector of constants, Ai is the $M \times M$ time-variant coefficient matrix, and $\varepsilon(t)$ is the $M \times 1$ exogenous factor or the error terms with a Gaussian distribution with mean zero and variance-covariance matrix Σ.

In our formulation, we adapt an existing European Central Bank (ECB) framework[1] to decompose the dynamic of 10yT yields in terms of monetary policy, demand, risk, and inflation shocks. The key in this model is to define the sign restriction priors that transform the dynamic of the underlying variables in the model (10yT yields, 5y5y inflation, real effective exchange rate for the dollar, and cyclical adjusted P/E ratios) into the shocks below (see our report, A hitchhikers guide to RV on the UST curve).

Curve directionality

One framework that adds to the understanding of the dynamic of the curve is a measure of how frequent the different modes for the curve (bull flattening, bear steepening, bear flattening, and bull steepening) have been in recent history. One can do this by constructing 4 indices, one for each mode, that measure the number of bp moves that can be attributed to that mode in a given historical window versus the sum of absolute moves on the curve over the same period. Those 4 indices can be grouped into short leg (2yT leg in the 2s10s dynamic) driven moves (adding the bear-flattening and bull steepening indices) and belly (10yT in the 2s10s dynamic) driven moves (adding bull flattening and bear steepening moves). This framework is useful to gauge the prevailing modes on the curve and understand the periods when the curve is undergoing a shift in its dynamic.

PCA on global 10y BEs

We run a 2-factor PCA on 10y breakevens across US, UK, AU, JP, EU, and CAD with at least 6 years of history. While central bank policy is certainly a factor for the global inflation market, especially around pivots or other surprises, we find that the first principal component (PC1) explains 85% of the variance in global breaks and is highly correlated with the price of oil. The second principal component of breakevens accounts for 9% of the variance, which results in a total of 94% covered by 2 factors. We find that PC2 correlates well to global financial stress and the Fed's published real rate term premium (see our report, Rates relative value update with PCA).

[1] *European Central Bank, Financial Stability Review, Nov. 2018,* www.ecb.europa.eu/pub/pdf/fsr/ecb.fsr201811.en.pdf

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