US Rates Watch

Monthly rates models: July '23 edition

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Rates Research
United States

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July 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: nominal and real yields look cheap to macro fundamentals, breakevens are fair, SOFR will remain low vs FF, and portfolios should be modestly risk on.

Duration & curve

Fair values for 10yT c.3.8-3.85% currently, a c.15-20bp upgrade since late May / early June, reflecting recent positive surprised in macro data, a hawkish shift in policy, and a bearish bias in global yields (see report Postcard from Brasil). Inflation does not seem to be leading the bearish dynamic. 10yT yields trade cheap to fair values consistent with US fundamentals and global yields (reflecting expectations for a slight upgrade of the macro backdrop over the next 3-6 months). Curve dynamic shifted in recent weeks, with a bias for the belly to underperform vs the wings.

Breakevens, TIPS & real yields

10y breakevens trade in line with fundamentals. A more orthodox BE dynamic suggests expectations for a recoupling of growth and inflation fundamentals. 10y real yields are c.20bp cheap vs our macro framework. The BE dynamic suggests 43% odds assigned to lower growth and lower inflation scenarios, and 45% odds to reacceleration.

Front end

SOFR/FF framework suggests high ON RRP take-up will keep SOFR low relative to FF. We expect this to continue until Fed liquidity is at least <16% of GDP.

Allocations

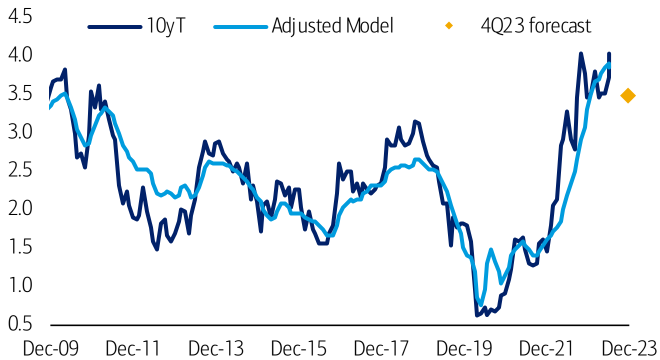
Our three-state framework for asset class returns suggests an upgrade of risk over 2Q23. A mean variance analysis of 2Q23 returns and covariances across asset classes continues to suggest optimal allocations profiles consistent with a transition market dynamic. Gauges of risk appetite obtained from ETF flows and futures positions show an upgrade of risk over June (from 50% risk neutral to 65% currently for the latter).

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.3.8%



Source: BofA Global Research; Bloomberg

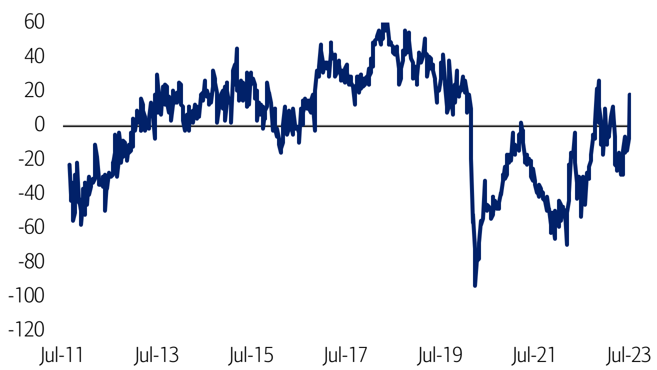
BofA GLOBAL RESEARCH

Our macro framework suggests that the 10yT fair value consistent with current US fundamentals is c.3.8%. This is roughly 15bp higher since our late-May / early-June update (see [Monthly rates models update]), reflecting recent positive surprised in macro data.

Treasury yields trade c.20-25bp cheap to fundamental fair value, suggesting expectations for some upgrade of fundamentals over the next 3-6 months.

Global yield framework

Exhibit 2: Residual of 10yT Global yield model
10yT fair value consistent with current global yields c.3.85%



Source: BofA Global Research

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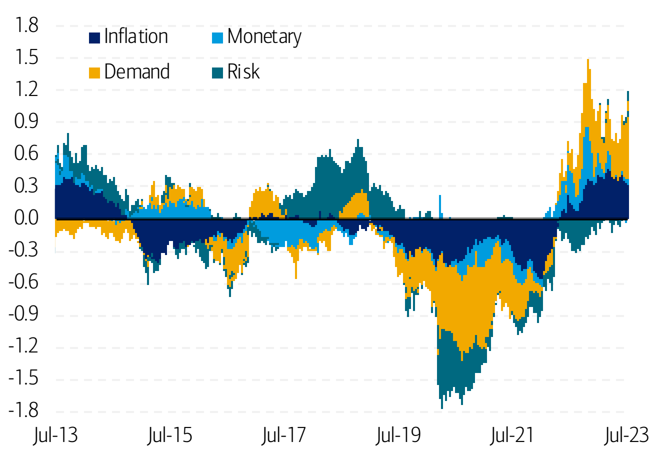
10yT fair value consistent with global yields is c.3.85%. This is 15bp higher than the end-May / early-June levels, reflecting both a broad cheapening of sovereign bond yields and a cheapening of US yields vs global yields.

The late cycle bias should be for USTs to trade fair to rich to global yields. A more significant 10yT selloff beyond c.3.85% levels would therefore likely need to be supported by a broader bearish momentum in global yields.

The 10yT yields are trading c.20bp cheap relative to global yields, favoring a buy the dip stance.

Decomposition of the 10yT dynamic

Exhibit 3: Decomposition of the 10yT dynamic
Monetary policy c.10bp, Risk c.10bp; Inflation c.40bp & Demand c.60bp



Source: BofA Global Research

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Steady state upgraded from c.2% in early 2022 to 2.6% currently (+10bp since end May / early June), suggesting an upgrade of neutral rate expectations. We expect it to increase further towards c.2.75-3%.

10yT yield range likely shifted higher from 0.75-3.25% (125bp envelope around a 2% steady state) over the last cycle to a range c.1.25-4.24% over the next 1-3 years (125-150bp envelope around a 2.75-3% steady state).

Monetary policy and risk shocks are currently +10bp higher since end May / early June, reflecting an upgrade of risk sentiment and a hawkish policy shift. Demand c.60bp (+5bp) and inflation c.40bp (-5bp) continue to drive some cheapening versus the steady state.

Fair value for 10yT c.3.8-3.85%.

Curve

Curve directionality

Exhibit 4: 2s10s directionality Index
Recent dynamic biased toward bear steepening (belly underperformance)

Source: BofA Global Research

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Front-end drives only 47% of the 2s10s curve dynamic over the last two weeks, down from 80% of the dynamic over the last month.

Curve directionality shifted from a dominant bear flattening over the last 2-3m to bear steepening recently, with belly underperforming vs wings.

Exhibit 5: Decomposition of the 2s10s dynamic
Belly underperforming vs wings over the last 2 weeks

	bull-Steep	bear-Flat	bull-Flat	bear-Steep
2w	23%	24%	4%	49%
1m	17%	28%	25%	31%
2m	11%	46%	20%	22%
3m	20%	40%	18%	22%

Source: BofA Global Research

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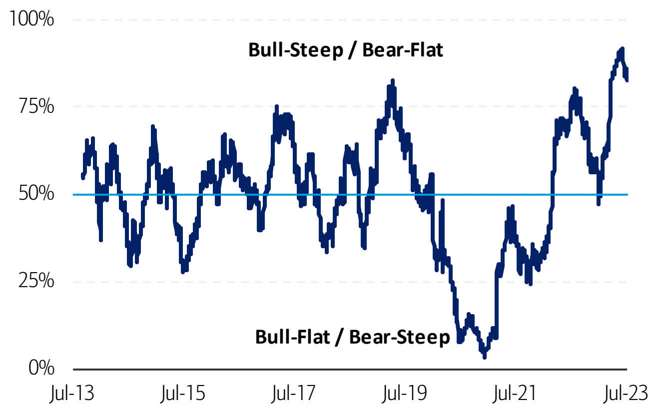
Exhibit 6: 5s30s directionality Index
Bear flattening continues to dominate the curve dynamic at backend



Source: BofA Global Research

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Belly drives 66% of the 5s30s curve dynamic over the last two weeks (down from 81% in late May / early June). Bias still for the belly to underperform vs the wings.

Exhibit 7: Decomposition of the 5s30s dynamic
Belly continues to lead the dynamic

	bull-Steep	bear-Flat	bull-Flat	bear-Steep
2w	10%	56%	22%	12%
1m	19%	54%	21%	6%
2m	18%	61%	15%	5%
3m	32%	50%	11%	6%

Source: BofA Global Research

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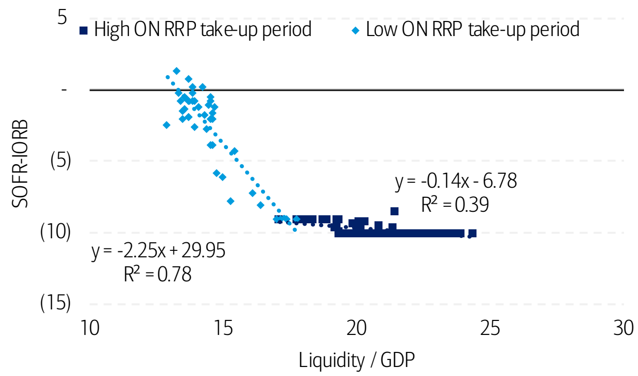
Front end

SOFR/FF basis

Exhibit 8: SOFR-IORB spread versus Liquidity / GDP
When ON RRP take-up is high, SOFR is anchored to ON RRP



Source: BofA Global Research, Bloomberg, Federal Reserve

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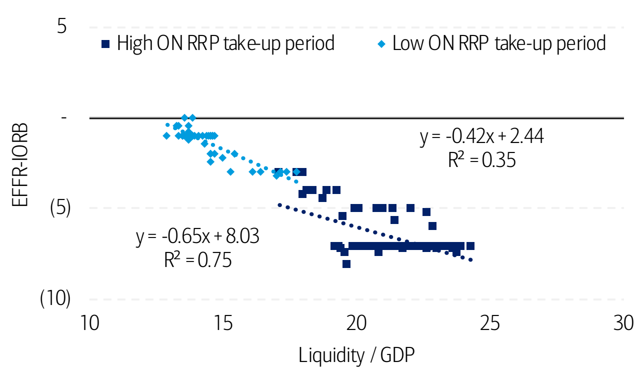
We forecast SOFR-IORB spread via a linear regression of ON RRP + Fed Reserves (Fed liquidity) over GDP & Marketable debt to GDP.

We break out the regression into two periods, a high and low ON RRP take-up period with the high take-up referring to anything above $500bn in ON RRP take-up.

We find that when ON RRP take-up is high, SOFR is anchored to ON RRP. We expect this trend to continue at least through year-end..

Exhibit 9: EFFR-IORB spread vs Liquidity / GDP
EFFR is less sticky versus SOFR but curve is less steep in low ON RRP period



Source: BofA Global Research, Bloomberg, Federal Reserve

BofA GLOBAL RESEARCH

We forecast EFFR-IORB spread via a linear regression of ON RRP + Fed Reserves (Fed liquidity) over GDP & Marketable debt to GDP.

We break out the regression into two periods, a high and low ON RRP take-up period with the high take-up referring to anything above $500bn in ON RRP take-up.

We find that EFFR is less sticky than SOFR, but the curve is less steep relative to SOFR-IORB in the low ON RRP take-up period.

Exhibit 10: Regression outputs for FF-SOFR spread (bps)
In high ON RRP take-up period, FF-SOFR spread widens as FF lifts faster

	Low ON RRP take-up			High ON RRP take-up		
Date	SOFR-IORB	EFFR-IORB	FF-SOFR	SOFR-IORB	EFFR-IORB	FF-SOFR
Dec-2022	-16	-5	11	-10	-6	4
Mar-2023	-18	-6	12	-9	-7	2
Jun-2023	-14	-5	9	-9	-6	3
Sep-2023	-8	-3	5	-9	-5	4
Dec-2023	-4	-2	2	-8	-4	4
Mar-2024	-1	-1	0	-8	-4	4
Jun-2024	0	-1	-1	-8	-4	4
Sep-2024	1	-1	-2	-8	-3	5
Dec-2024	2	0	-2	-7	-3	4

Source: BofA Global Research, Bloomberg, Federal Reserve

BofA GLOBAL RESEARCH

Using the regression inputs for both periods, we forecast FF-SOFR spread based on our forecast for ON RRP, Reserves, Marketable debt ex Fed and GDP.

In the high ON RRP take-up regression output, FF-SOFR spread widens as EFFR lifts off faster than SOFR.

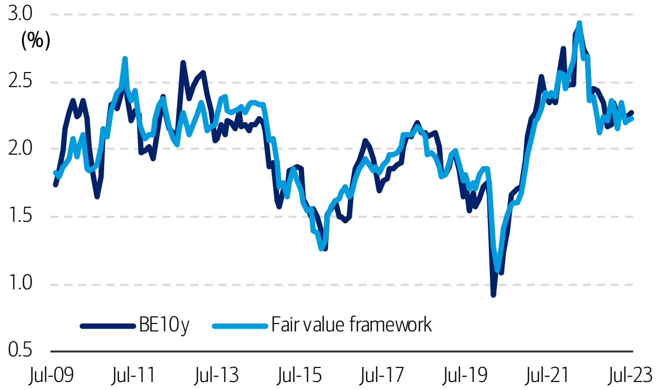
In the low ON RRP take-up regression output, FF-SOFR spread narrows as SOFR lifts off faster than EFFR.

Recent upward pressure on SOFR, which we incorporate into our model, has pulled forward the projected tightening in SOFR-IORB.

TIPS

Macro framework for breakevens (BEs)

Exhibit 11: Macro framework for 10y BE
10y BE fair value c.225bp, market trading in line with fundamentals



Source: BofA Global Research; Bloomberg

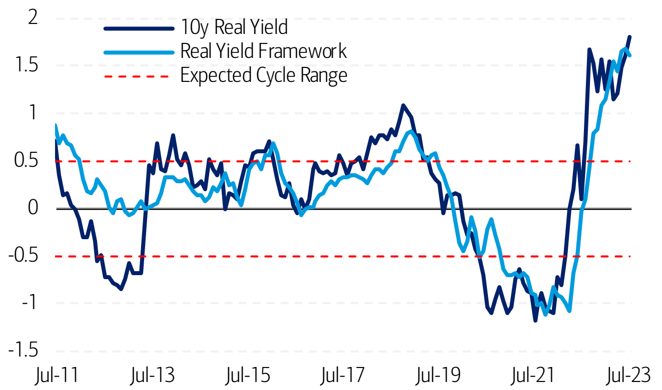
BofA GLOBAL RESEARCH

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

US 10y breakevens fair value c.225bp, up from c.220bp in late May / early June. The market is trading in line with fundamentals.

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

Exhibit 12: 10y real yield framework
Fair value for 10y real yields in macro framework c.160bp



Source: BofA Global Research

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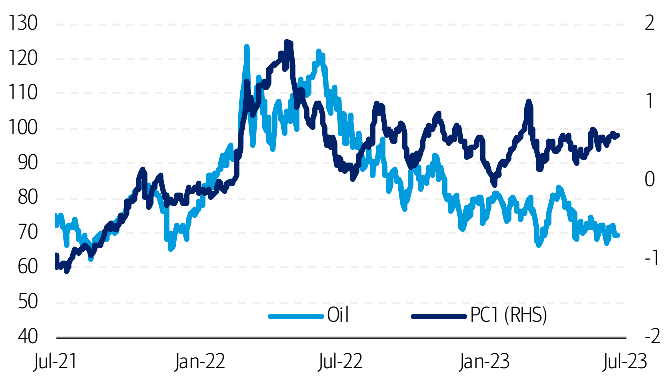
US 10y real rate fair value is c.160bp. The market is trading 10y real yields 20bp cheap to the fair value level suggested by our macro framework.

PCA on global 10y BEs

Exhibit 13: First breakeven closely matches 1st crude oil futures
Oil is a primary driver of global inflation expectations



Source: BofA Global Research

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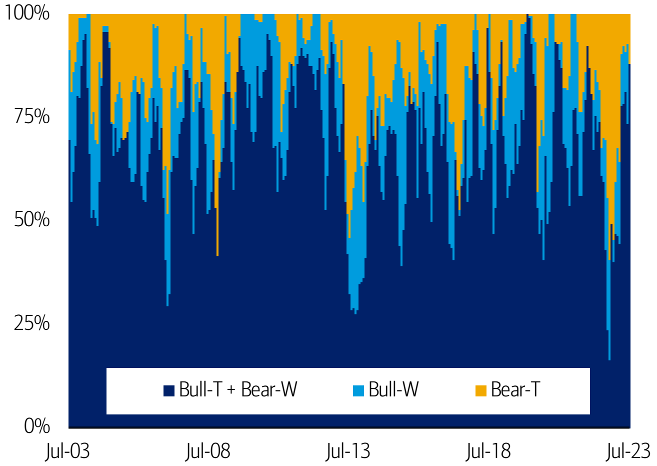
1st principal component of global 10y BEs suggests that oil has become the main driver of global inflation expectations for several years now.

This also implies that any single central bank may have very limited impact on its domestic inflation expectation markets.

Directionality of 10y BEs

Exhibit 14: Breakeven directionality breakdown

10y breakevens showing a more standard directionality now



Source: BofA Global Research

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10y BEs are showing a more standard directionality. Orthodox moves (bull tightening & bear widening) are back to dominating the dynamic (c.88%) and in line with historical frequencies, suggesting market expectations for a higher correlation and causality between growth and inflation in '23.

Bear widening moves dominated the dynamic of 10y BEs over the last two weeks, suggesting increasing expectations for reacceleration (higher growth and higher inflation).

Exhibit 15: 10y Breakeven directionality

Bull tightening and bear widening driving the 10yBE dynamic again

	bull-Tight	bear-Wide	bull-Wide	bear-Tight
Current	43%	45%	0%	12%
1m	43%	40%	9%	9%
2m	28%	35%	11%	25%
3m	31%	33%	12%	25%

Source: BofA Global Research

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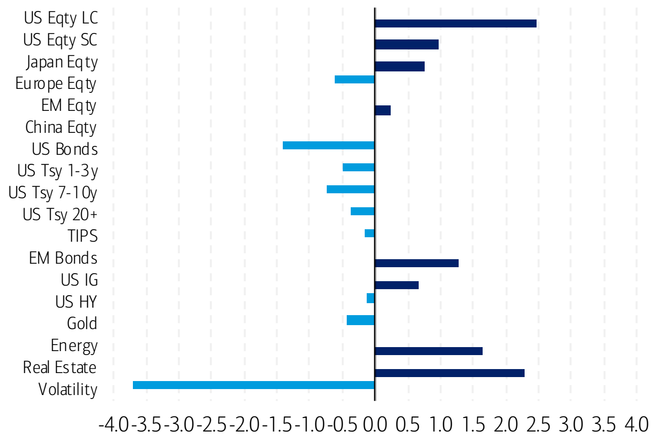
Asset allocation

Flows and allocation bias

Exhibit 16: Gauge of risk profile obtained from ETF flows
Profile suggests upgrade of risk appetite over June



Source: BofA Global Research

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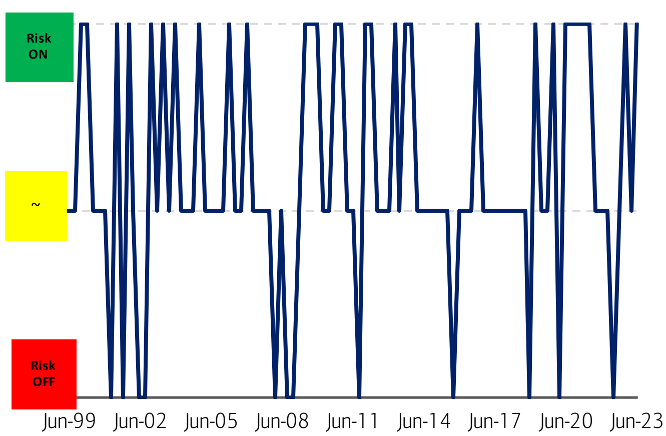
Gauge of risk profile and allocations obtained from ETF flows shows upgrade of risk over the last couple of weeks:

- Bonds – Short USTs across the curve and TIPS. Long EM.
- Equities – Long US LC & SC, Japan, and EM. Short Europe and neutral Chinese equities.
- Credit – Long IG & short HY
- Alternatives – Short gold & long Energy & Real Estate
- Volatility – Short equity volatility

Broadly, these continue to suggest a moderate bias towards risk on.

Exhibit 17: Three-state framework for asset class returns…
… suggests an upgrade of risk over 2Q23



Source: BofA Global Research

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Upgrade of risk in 2Q vs 1Q23. Allocation profiles still consistent with a transition market dynamic in 2Q23.

Market dynamic over 3Q is likely to continue to drive optimal asset allocations profiles between those implied by risk-off/recession and transition states. Demand for duration is likely to stay robust over 3Q in our baseline view.

Exhibit 18: Transition probabilities between different states for the market dynamic
Transition probability from risk-off/recession to risk-on (57%) is much larger than the transition probability from risk-on to risk-off

	Risk off	~	Risk on
Risk off	14%	29%	57%
~	16%	61%	23%
Risk on	6%	61%	32%

Source: BofA Global Research

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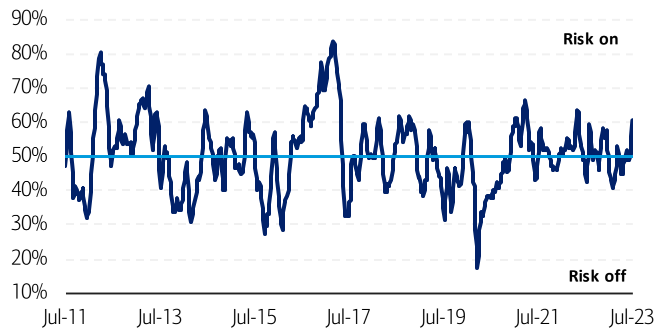
Exhibit 19: Positioning bias extracted from futures across assets
Recent bias shifted from neutral to risk on



Source: BofA Global Research

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Positioning bias extracted from futures across asset classes suggests an upgrade of risk from a neutral risk context into a risk on bias (c.65% currently vs 50% - neutral risk – at the end of May / early June).

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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