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US Rates Viewpoint

Fund duration & curve positioning: a PCA regression approach

Another step towards understanding UST positioning

In this note we outline an approach for gauging duration and curve positioning across 28 total return fixed income funds with a cumulative AUM of $1.4tn. We approximate how this investor base is positioned overall relative to the US Aggregate Bond Index benchmark. We find these funds have rebuilt the notable long duration positions they held at the start of the year, after challenged conviction post Q1. This trend is largely consistent with the results from our FX and Rates Sentiment Survey. We will incorporate this framework in our weekly flows & positioning report going forward.

Methodology explained

Specifically, we use a rolling PCA regression to obtain the asset betas for each fixed income fund to gauge the fund's exposure to these assets. The goal is to use a systematic approach to analyze the influence of multiple asset classes on the returns of a fixed income fund. We utilize PCA in conjunction with OLS regression to derive insights into the underlying factors affecting fund returns. The asset classes considered include UST, MBS, IG, and changes in 2y10y spread (Curve).

Funds appear long with no significant curve bias

Our results suggest that funds have renewed long duration positions maintained at the start of the year. Alongside strong economic data in Q1, funds retreated their longs but have reinstated positions following clearer signs of moderating growth, labor, and inflation data. Fund curve positioning appears less outsized recently. Betas suggest curve positioning switched from steepeners to flatteners in Q1, consistent with the stronger economic data. In mid-February flatteners appear to have been closed, and funds have been close to neutral on the curve since then. Recent fluctuations in curve positioning have also been relatively small vs history. Our historical results track reasonably well with our FX and Rates Sentiment Survey and curve momentum.

Tracking dispersion of fund positioning

We can also monitor dispersion of positions across the funds we include in our regression. Funds currently maintain relatively low dispersion of implied positioning in duration and curve. This suggests that long duration views are common across many funds and that few have strong curve positions vs history.

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CTA = Commodity Trading Advisor

AUM = Assets Under Management

UST = US Treasury

Agg = Aggregate

MBS = Mortgage-Backed Security

IG = Investment-grade

PCA = Principal Component Analysis

OLS = Ordinary Least Squares

Refer to important disclosures on page 7 to 8. Analyst Certification on page 5. **12702044**

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Fund positioning framework

Another step towards understanding positioning

In this note we outline an approach for gauging duration and curve positioning across 28 total return fixed income funds with a cumulative AUM of $1.4tn. These funds were selected because of their size and relatively common benchmark of the US Aggregate Bond Index. In our weekly flows report (see: US Rates Watch) we present a variety of ways to monitor UST flows and positioning across investor types. This framework allows us to approximate how US total return benchmark funds are positioned.

We find these funds have rebuilt the notable long duration positions they held at the start of the year, after challenged conviction post Q1. This trend is largely consistent with the results from our FX and Rates Sentiment Survey (see: Double dipping in duration). We will update the output of our framework on a weekly basis and include alongside our other flows and positioning indicators.

Methodology explained

In this analysis, we adopt a similar framework to our top-down CTA model (see report: CTAs impact on rates market, 18 August 2020). Specifically, we use a rolling PCA (Principal Component Analysis) regression to obtain the asset betas for each fixed income fund to gauge the fund's exposure to these assets back to 2015.

The goal is to use a systematic approach to analyze the influence of multiple asset classes on the returns of a fixed income fund. We utilize PCA in conjunction with OLS (Ordinary Least Squares) regression to derive insights into the underlying factors affecting fund returns. The asset classes considered include UST (US Treasury Total Return Index), MBS (MBS Total Return Index), IG (Corporate Total Return Index), and changes in 2y10y spread (Curve).

The first step involves preparing historical data for each of the asset classes as well as the 28 funds' returns (plus the benchmark), which serve as the dependent variables. For the independent variables (asset classes), we calculate the daily returns (percentage) for the first 3 asset classes, and the daily difference/change in basis points for the Curve variable. These variables are then standardized to have a mean of zero and a unit variance to address the different scales and ensure that all variables contribute equally to the PCA.

In the second step, we apply PCA on a rolling 2-month period to calculate the principal components (PCs) that explain the maximum variance for each rolling window. The number of PCs is selected based on the explained variance ratio to ensure that sufficient data variance is captured while reducing dimensionality.

Third, for each rolling window, an OLS regression is applied where the dependent variable, i.e. fund return, is regressed against the selected principal components. We choose a rolling 2-month window for the OLS regressions that allows betas to respond relatively quickly to changing market trends but avoids the noise in estimations on shorter windows. The beta coefficients obtained from this represent the sensitivity of fund returns to each principal component.

Post regression, the betas from the PCA regression can then be transformed back to the original asset space, resulting in a set of beta weights that represent the fund's exposure to each original asset class (UST, MBS, IG, Curve).

The transformed betas offer insight into how each asset class impacts fund returns. For example, positive betas indicate a positive influence on fund returns when the asset class performs well, whereas negative betas suggest an inverse relationship.

The rolling nature of the methodology allows us to capture the time-varying betas for continuous updating and monitoring of the change in a fund's holdings/exposure.

Limitations

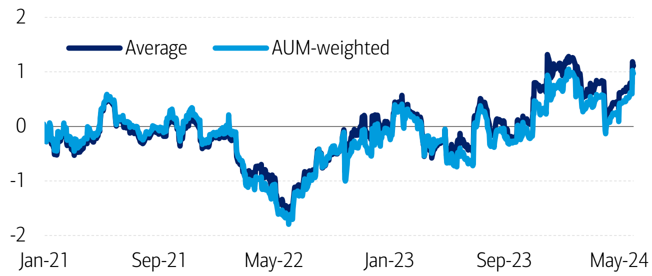
In this framework, we are making assumptions about how funds are positioned based on a return analysis. While this can work well for systematic strategies, it can be more challenging for discretionary funds. Another limitation is the betas can be lagged due to a 2m rolling window, which means any recent positioning changes might not be immediately reflected in the regression results.

Using PCA regression to understand positioning

Using the betas, we can identify fund positioning relative to the Aggregate Index (Agg). In our framework we examine the standardized difference between the asset betas of 28 funds and the asset betas of the Agg benchmark. We compile the results across funds by looking at average and AUM-weighted average differences and show the standardized results for UST and curve since the start of 2021 (Exhibit 1 & Exhibit 3). We also track the week over week (WoW) change in UST and curve sensitivities (Exhibit 2 & Exhibit 4).

Exhibit 1: UST beta from PCA regression (Z-score)

Betas suggest funds have been adding duration since the first week of May, higher beta = fund outperformance consistent with UST rallies



Source: BofA Global Research, Bloomberg, Z-score calculated over fund beta differences vs Agg back to May 2015

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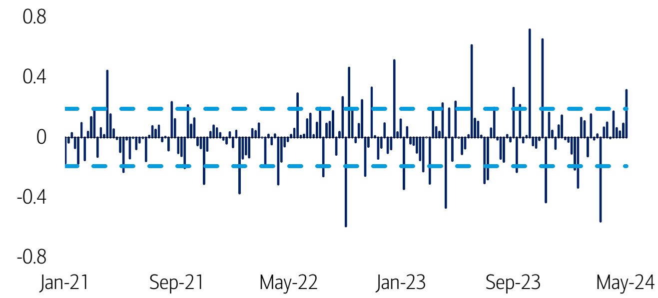
Exhibit 2: WoW change in UST beta from PCA regression

Funds have notably added duration in the last week of May, dashed line = 1 stdDev of weekly beta changes



Source: BofA Global Research, Bloomberg; WoW changes calculated from average fund beta

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Funds have added back duration

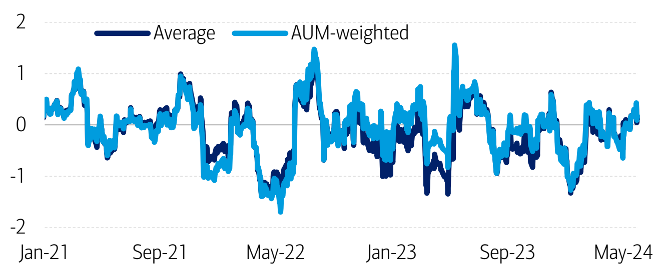
Our results suggest that funds have renewed long duration positions maintained at the start of the year (Exhibit 1). Alongside strong economic data in Q1, funds retreated their longs but have reinstated positions following clearer signs of moderating growth, labor, and inflation data. In recent weeks, funds have been adding back duration positions and indeed we see a significant add the week ending May 31 (Exhibit 2).

Funds show less strong curve position

Fund curve positioning appears less outsized recently (Exhibit 3). Betas suggest curve positioning switched from steepeners to flatteners in Q1, consistent with the stronger economic data. In mid-February flatteners appear to have been closed, and funds have been close to neutral on the curve since then. Recent fluctuations in curve positioning have also been relatively small vs history (Exhibit 4).

Exhibit 3: Curve beta from PCA regression (Z-score)

Betas suggest funds have relatively neutral curve view, higher beta = fund outperformance consistent with steeper curves



Source: BofA Global Research, Bloomberg, Z-score calculated over fund beta differences vs Agg back to May 2015

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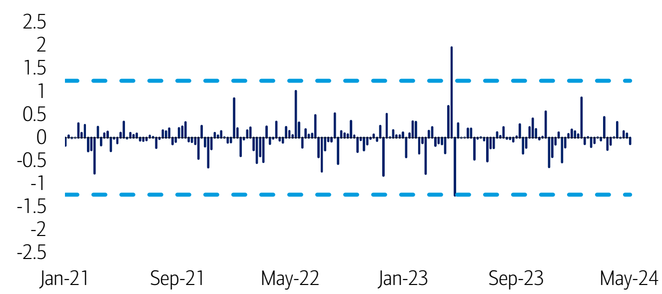
Exhibit 4: WoW change in curve beta from PCA regression

Funds curve positioning shifts have recently been relatively small, dashed line = 1 stdev of weekly beta changes



Source: BofA Global Research, Bloomberg; WoW changes calculated from average fund beta

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Comparing results to other positioning sources

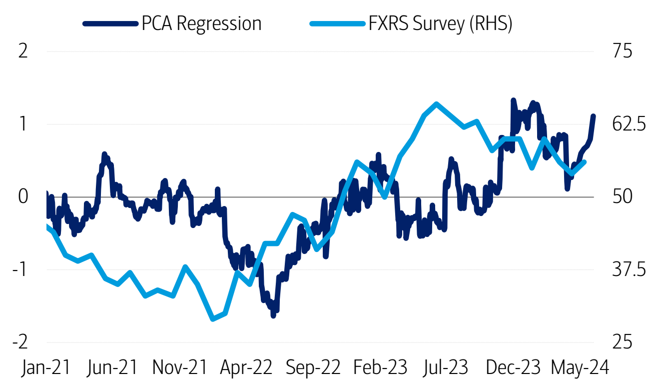
Our regression results track reasonably well with other indicators of positioning. We look at our FX and Rates Sentiment (FXRS) Survey, reported quarterly fund MBS allocations, and curve momentum to compare positioning in US duration, MBS, and curve positioning, respectively.

FXRS Survey

In Exhibit 5, we compare the average fund less benchmark UST beta to the US duration indicator from our FX and Rates Sentiment (FXRS) Survey. While our FXRS Survey captures global fixed income benchmark investors, our regression work is focused on domestic benchmark funds. We would not expect these numbers to be the same due to fund composition however, we do see that they reflect similar large trends post Covid.

Funds built up an underweight position until mid '22 and then began to cover it alongside hard landing concerns up until '23. While our FXRS Survey suggests that funds kept adding through mid '23, domestic funds modestly pared back in Q1 '23. Both indicators show that funds were long duration at the start of '24 and then pared back positions over Q1 alongside strong data. Our most recent survey showed that funds had added duration at the start of May but had appetite to keep adding given large divergence between view & positioning (see: Double dipping in duration). Our regression suggests that funds indeed have added duration notably since then (Exhibit 5).

Exhibit 5: UST PCA regression beta vs FXRS Survey Bull-Bear Index
US duration indicators capture similar trends



Source: BofA Global Research, Bloomberg, PCA Regression beta z-score calculated daily over fund beta differences vs Agg back to May 2015, FXRS Survey is conducted monthly
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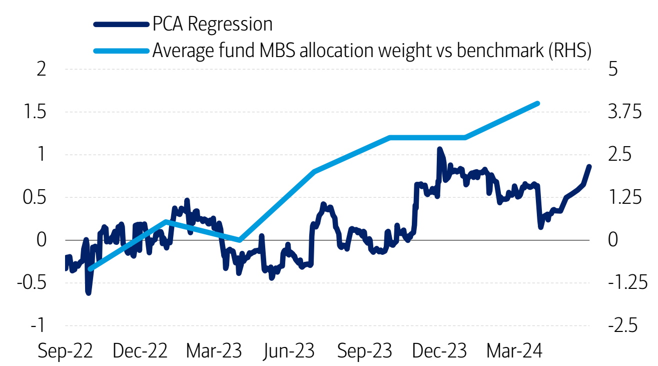
Exhibit 6: MBS PCA regression beta (Z-score) vs fund recorded position (PPTS)
MBS relative positioning indicators capture similar trend



Source: BofA Global Research, Bloomberg, PCA Regression beta z-score calculated over fund beta differences vs Agg back to May 2015
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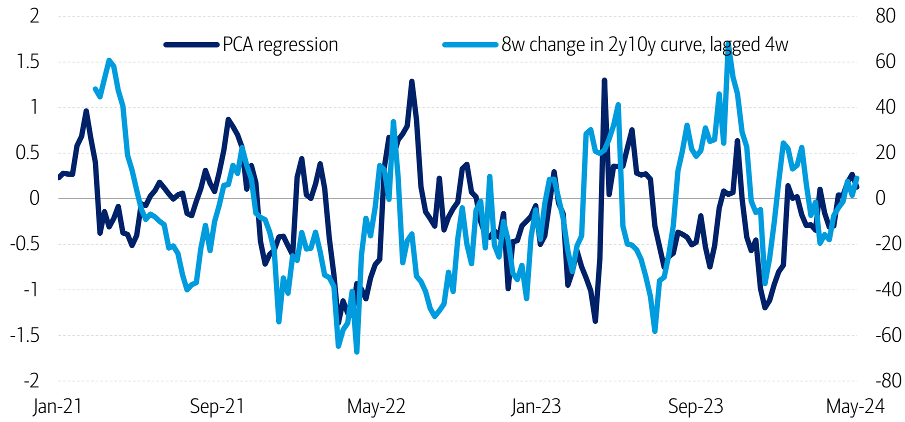
Reported fund allocations

While we do not have survey data for MBS positioning, we have historically tracked the reported MBS allocation at quarter end for the same 28 funds used in our regression. Exhibit 6 suggests a roughly similar pattern of close to benchmark MBS positioning from Q3 '22 through Q1 '23, followed by a build through end '23. In Q1 '24, fund allocations suggest more of a build in MBS overweight positions than our model. Our regression suggests that funds are at similar overweight MBS allocation as the start of the year after cutting positions in March.

Momentum in curve

We have very limited data on curve positioning historically to compare with betas. In Exhibit 7 we show a history of the average fund's relative curve beta vs realized curve volatility. Implied fund curve positioning has typically followed realized curve moves with a lag. This is relatively consistent with the idea that funds will maintain positions that have performed better. Recent neutral performance on curve is consistent with less of a positioning bias from fixed income funds.

Exhibit 7: Curve PCA regression beta vs lagged realized curve moves (BPS)
Implied positioning tends to follow realized curve moves



Source: BofA Global Research, Bloomberg; PCA Regression beta z-score calculated over fund beta differences vs Agg back to May 2015
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Tracking dispersion of fund positioning

We can also monitor dispersion of positions across the funds we include in our regression. Exhibit 8 and Exhibit 9 show the z-score of beta standard deviation across the 28 funds for duration and curve, respectively. Relative to history, funds currently maintain relatively low dispersion of implied positioning in duration and curve. This suggests that long duration views are common across many funds and that few funds have strong curve positions vs historical dispersions.

Exhibit 8: Dispersion of funds' UST betas (Z-score)
Lower z-score means lower dispersion and implies the views are more concentrated vs historical averages

Source: BofA Global Research, Bloomberg; Z-score calculated over standard deviations of fund betas back to May 2015
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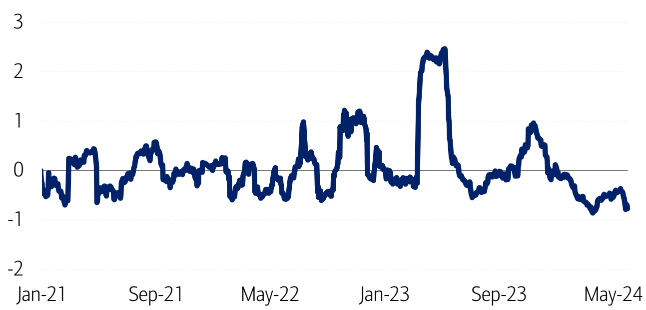
Exhibit 9: Dispersion of funds' Curve betas (Z-score)
Lower z-score means lower dispersion and implies the views are more concentrated vs historical averages



Source: BofA Global Research, Bloomberg; Z-score calculated over standard deviations of fund betas back to May 2015
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Bottom line: Our PCA regression framework is a helpful tool in understanding fund positioning. Our results suggest that funds have reinstated long duration positions maintained at the start of the year in recent weeks. We also see that funds show limited curve positioning vs history. Beta dispersion indicates that views are relatively concentrated across funds. Our historical results track reasonably well with our FXRS Survey, recorded fund allocation weights, and curve momentum. This framework will be incorporated in our weekly flows analysis going forward (see most recent: Mixed UST positioning picture).

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