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Sweating the small stuff

A systematic approach to Treasury relative value

- The combination of a lack of direct Fed purchases and changes in market structure (liquidity, availability of balance sheet, etc.) have led to a significant expansion in the opportunity set available to Treasury RV traders.
- The rise of foreign official outflows and the associated build-up in dealer inventories exacerbated the situation, particularly in the front end.
- We consider systematic strategies across a range of RV signals and trade constructions.
- Generally, we find fading wide yield error differentials via swap spread switches delivers attractive risk-adjusted returns, and significantly outperforms outright switches.
- Agnostic bond selection within a relatively narrow remaining-maturity bucket, rather than sticking to a particular original maturity, delivers more attractive returns.
- We introduce a daily report summarizing these trading signals across the Treasury yield curve.

US Fixed Income Strategy

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A systematic approach to Treasury relative value

In the wake of the financial crisis, non-traditional monetary policy became arguably the most important driver of the Treasury market. Clearly the greatest impact was more macro, with a historic decline in long-term yields and bull steepening of the curve. But even issue-specific relative value was no place to hide from QE: by using yield errors to select bonds for purchase, the Fed effectively wrung most of the opportunities out of the market. **One can see this in the RMSE about the Treasury par curve, which was pushed below 1 bp of yield during the QE era** (**Exhibit 1**).

At this point, however, with tapering completed more than 18 months ago, the previous regime is now firmly behind us. And in the meantime, outflows from central banks have become an increasingly important driver of Treasury markets (though they have slowed more recently), leading to significant secondary supply. **At the same time, the combination of rising liquidity premium, lack of access to balance sheet, and a srhinking RV trading community have also contributed to a greater frequency of issue-specific pricing dislocations** (see *Times like these: Structural changes in off-the-run Treasury pricing and liquidity*, J. Barry et al., 2/10/16). The net result has been a substantial expansion in the RV opportunity set: overall RMSE is back to multi-year highs, particularly in the front- and long-end of the curve (**Exhibit 2**).

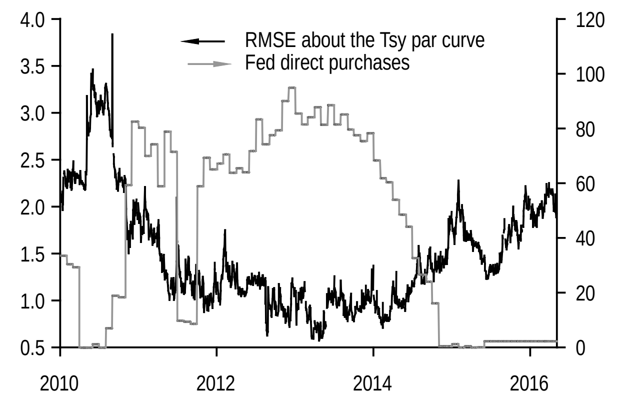
With the macro environment an ongoing frustration for investors, the rise of RV across the curve comes at an opportune time for those thirsty for alpha. That said, one can employ a number of frameworks for both selecting and executing such trades, including a range of valuation metrics (yield error, swap spread, etc.) and trading constructs (e.g., outright or swap spread switch). Ultimately the optimal trading strategy for monetizing RV opportunities is an empirical question, which we have considered on previous occasions (e.g., see discussion in Interest Rate Derivatives and Treasuries, *US Fixed Income Markets 2016 Outlook*, 11/25/2015). But particularly in light of recent uncertainty around the path of monetary policy, not to mention a still-murky global growth and inflation outlook, we think now is an opportune moment to revisit and expand this analysis.

Specifically, we consider a set of strategies across a range of trading signals and structures. Our goal is to isolate those combinations which deliver the highest information ratio, for use either in systematic trading or as a relative value overlay for more macro decisions. We also introduce reports which will be included in our daily analytics to monitor RV opportunities across the curve.

Exhibit 1: Issue-specific relative value trading in Treasuries has become more attractive as the Fed QE programs are no longer distorting the market…

RMSE about the Treasury par curve (LHS) versus monthly Fed direct purchases of Treasuries, agency debentures, and agency MBS (RHS);

bp $bn of 10Y equivalents



Note: Treasury par curve is calculated as a spline fit.
Source: J.P. Morgan, FRBNY

Exhibit 2: …particularly in the front- and long-end of the yield curve

RMSE about the Treasury par curve in buckets by remaining maturity; bp of yield

			Past 2 yrs		Past 5 yrs	
Sector	Curr	3m ago	Max	Min	Max	Min
1-2 yrs	1.5	1.7	2.7	0.7	2.7	0.4
2-3 yrs	2.5	2.2	3.0	0.6	3.0	0.4
3-5 yrs	1.4	1.7	2.3	0.9	2.4	0.6
5-7 yrs	0.9	1.3	2.1	0.7	4.4	0.6
7-10 yrs	1.7	2.1	2.8	0.9	4.1	0.5
10-15 yrs	3.0	2.4	4.0	0.9	4.0	0.3
15-20 yrs	7.8	1.2	9.2	0.0	9.2	0.0
>20 yrs	2.5	2.6	3.4	0.5	3.5	0.1
All	1.9	1.9	2.3	0.8	2.3	0.6

Note: Current as of 5/4/16.
Source: J.P. Morgan

Methodology

We backtest a number of trading strategies over the past 5+ years since the first Fed QE program in early 2009. **We consider three RV metrics in particular: yield error relative to our fitted Treasury par curve, Libor swap and OIS spreads**. We then assume daily trades, buying the cheap and selling the rich bond using each measure (buy the highest yield error, sell the lowest; buy the narrowest spread, sell the widest), and holding the

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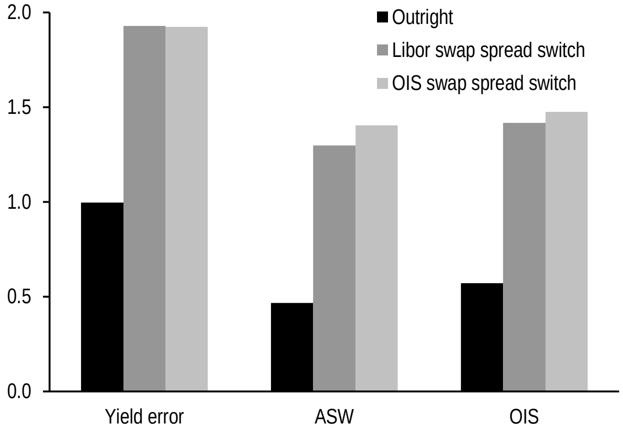
Exhibit 3: Trading Treasury RV on a matched-maturity swap spread basis has produced much better results over the past five years than outright switches

Annualized information ratio for several systematic Treasury RV trading strategies from Jan 2010 to May 2016, equal weighted average across 1-3Y, 3-5Y, 5-10Y, and 10-30Y remaining maturity buckets; unitless



Note: Our systematic strategy consists of overlapping daily trades, buying the cheapest and selling the richest bond in a given maturity bucket using either yield error, true asset swap sperad, or OIS swap spread as the signal. Trades are held for one month following initiation, and we assume term repo rates for the holding period to calculate carry.
Source: J.P. Morgan

trade for one month either outright or on a matched-maturity spread basis (again using either Libor or OIS swaps). We also incorporate the effects of carry, assuming the trades are financed with term repo to match the holding period, assuming GC rates unless that particular issue is trading special at the time of trade initiation.

Results

The first consideration we address is optimal trading signals and construction. **On the former**, we consider yield error and matched-maturity spread differentials (OIS and Libor) as a rich/cheap measure. **For the latter**, trades are either held outright (i.e., one bond versus the other) or as a swap spread switch (again either Libor or OIS). We then calculate the average information ratio across all permutations of these strategies, using several remaining-maturity buckets to avoid taking too much duration risk in each RV switch—and ignoring the original maturity, which we address later. **The results argue for using yield error as the trading signal and structuring these positions as matched-maturity swap spread switches** (**Exhibit 3**). This furthermore suggests that the Treasury yield curve is generally more volatile than the term structure of swap spreads in the various maturity buckets. In other words, trading outright switches introduces a larger noise term than swap

Exhibit 4: Agnostically selecting bonds regardless of original maturity generally improves volatility-adjusted returns as well

P/L statistics for a systematic Treasury RV trading strategy* using yield error as the trading signal and structured as matched-maturity swap spread switches; Average and 10th and 90th percentiles in bp of yield

Sector	Orig mat	Hit rate	Avg	Inf Ratio	10th pctl	90th pctl
2Y-3Y	All	83%	1.7	2.9	-0.6	4.1
2Y-3Y	3s	72%	0.9	1.6	-1.1	3.0
2Y-3Y	5s	81%	1.3	2.3	-0.6	3.5
3Y-5Y	All	79%	1.8	2.5	-1.0	4.8
3Y-5Y	5s	65%	0.8	1.2	-2.0	3.5
3Y-5Y	7s	74%	1.0	2.3	-0.6	3.1
5Y-7Y	All	69%	1.2	1.5	-1.5	3.8
5Y-7Y	7s	67%	0.8	1.4	-1.5	3.0
5Y-7Y	10s	65%	0.7	1.2	-1.5	2.9
7Y-10Y	All	61%	0.9	1.2	-2.0	3.9
7Y-10Y	10s	65%	0.8	1.1	-2.2	3.9
10Y-30Y	All	63%	1.0	1.0	-2.5	4.6

* See Exhibit 3 for details.
Note: Information ratios are annualized.
Source: J.P. Morgan

spreads. **Therefore, though trading spread switches generally incurs larger transaction costs, we believe the improvement in volatility-adjusted returns is worth the wider bid/ask spreads**.

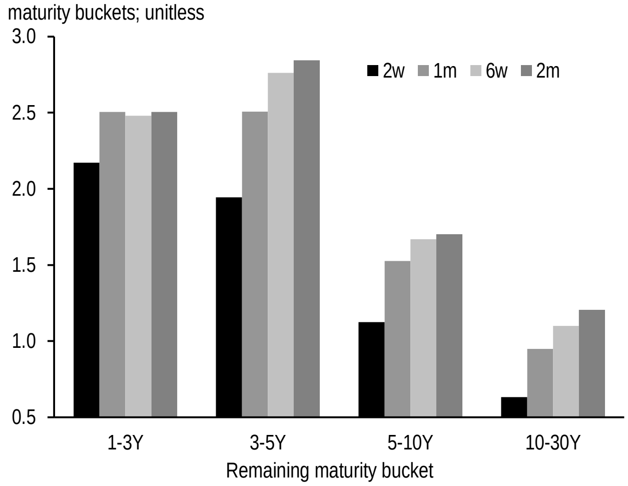
We also consider potential advantages in limiting bond selection within a particular maturity bucket. For example, one common approach to Treasury RV trading is to fade mispricing among relatively nearby issues with the same initial maturity. The utility of doing so, however, is ultimately an empirical question. Therefore, we repeat the experiment above, using yield error differentials as a trading signal and matched-maturity spread switch constructions, but limited to each original maturity. **The results suggest that agnostic bond selection (i.e., across all issues in a given bucket, regardless of original maturity) delivers a consistently higher hit rate and information ratio, as well as a more attractive distribution of returns across the curve (Exhibit 4).** Clearly this does not account for potential liquidity constraints for deep off-the-run issues. However, to the extent that the bonds can be sourced, we recommend not limiting oneself to a particular original maturity in identifying rich/cheap pairs.

Finally, we consider the optimal holding periods. **In other words, what is the typical mean reversion timeline over which mispricings along the Treasury curve are identified and reversed by RV traders**. Therefore, we perform three additional backtests of our original maturity-agnostic bond selection strategy, again grouped into remaining-maturity buckets. Our goal is to once again maximize the information ratio of returns**.** **The results, presented in Exhibit 5, suggest that, all else equal, longer holding periods tend to increase volatility-adjusted returns**. This is consistent with the more anecdotal observation that as balance sheet constraints and overall poor hedge fund returns over the past few years have eroded the base of RV traders, small mispricings tend to persist for longer. That said, in most cases the marginal improvement between 1- and 2-month holding periods is rather modest.

To facilitate identification of Treasury RV opportunities, we introduce a daily report summarizing the rich/cheap bonds by remaining maturity bucket, both with agnostic bond selection and grouped by original maturity. This report will be included in our daily analytics packages, and a sample is available on the following page.

Exhibit 5: Longer holding periods tend to increase the volatility-adjusted returns from RV strategies

Information ratio systematic Treasury RV trading strategy* using yield error as the trading signal, and structuring positions as a matched-maturity swap spread differential, using different holding periods as indicated and in different remaining-maturity buckets; unitless



* See Exhibit 3 for details. We consider 2-week, 1-month, 6-week, and 2-month holding periods, and calculate carry using matched GC term repo (in the absence of specialness).
Note: Information ratios are annualized.
Source: J.P. Morgan

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Issue-Specific Treasury Relative Value Report

Remaining Maturity	Richest issue by yield error	Orignal Mat	Old	Yld Err	ASW	Cheapest issue by yield error	Orignal Mat	Old	Yld Err	ASW	Yield Error differential stats Curr	1Y Avg	R/C	Z-score	ASW differential stats Curr	1Y Avg	R/C	Z-score
1y-3y	4% AUG-18	10	30	-8.3	23.9	4.5% MAY-17	10	35	2.8	18.1	11.1	3.1	8.0	1.8	-5.9	-4.5	-1.4	-0.3
3y-5y	8.5% FEB-20	30	59	-4.4	8.7	2.125% AUG-20	7	32	2.2	-3.7	6.6	3.2	3.3	1.5	-12.4	-10.9	-1.5	-0.4
5y-10y	2.75% NOV-23	10	9	-2.9	-11.9	2.125% JUN-22	7	10	1.1	-13.2	4.1	2.2	1.9	1.1	-1.3	-0.8	-0.5	-0.3
10y-30y	4.75% FEB-37	30	32	-7.8	-18.8	5.5% AUG-28	30	39	4.4	-13.7	12.2	4.5	7.8	1.4	5.1	5.1	0.0	0.0

*Yield error and maturity matched spread differential stats for selected pairs in various maturity buckets. The selection is based on max/min yield error irrespective of original issue sector.

Original Maturity	Remaining Maturity	Richest issue by yield error	Orignal Mat	Old	Yld Err	ASW	Cheapest issue by yield error	Orignal Mat	Old	Yld Err	ASW	Yield Error differential stats Curr	1Y Avg	R/C	Z-score	ASW differential stats Curr	1Y Avg	R/C	Z-score
3s	1y-3y	0.875% OCT-17	3	18	-0.4	15.6	0.875% OCT-18	3	6	2.8	12.1	3.2	1.9	1.3	0.9	-3.5	0.2	-3.8	-1.4
5s	1y-3y	0.875% JAN-18	5	39	-0.4	14.4	1.375% JUL-18	5	33	2.4	12.9	2.7	1.4	1.3	1.0	-1.5	0.3	-1.8	-1.2
5s	3y-5y	1.375% APR-21	5	0	-2.5	-3.3	1.625% JUN-20	5	10	2.0	-2.5	4.4	5.0	-0.5	-0.5	0.8	-0.9	1.7	1.0
7s	1y-3y	2.625% APR-18	7	59	-0.8	15.5	1.375% SEP-18	7	55	2.7	12.5	3.6	1.6	2.0	1.6	-3.1	-0.7	-2.4	-1.5
7s	3y-5y	1.125% MAY-19	7	47	-1.4	10.2	2.125% AUG-20	7	32	2.2	-3.7	3.6	0.8	2.8	1.7	-13.9	-9.4	-4.5	-1.9
7s	5y-10y	1.875% NOV-21	7	17	-0.8	-8.3	2.125% JUN-22	7	10	1.1	-13.2	1.9	0.5	1.4	1.4	-4.9	-2.7	-2.1	-2.4
10s	1y-3y	4% AUG-18	10	30	-8.3	23.9	4.5% MAY-17	10	35	2.8	18.1	11.1	3.1	8.0	1.8	-5.9	-4.5	-1.4	-0.3
10s	3y-5y	3.625% FEB-20	10	24	-2.4	4.9	2.625% NOV-20	10	21	2.1	-4.2	4.5	0.8	3.6	1.6	-9.1	-4.3	-4.7	-1.8
10s	5y-10y	2.75% NOV-23	10	9	-2.9	-11.9	1.75% MAY-22	10	15	0.5	-12.4	3.4	1.6	1.9	1.0	-0.5	0.0	-0.5	-0.3
30s	1y-3y	8.75% MAY-17	30	65	-6.9	27.8	8.875% AUG-17	30	64	-3.9	21.7	3.1	1.2	1.9	0.2	-6.2	0.2	-6.3	-1.3
30s	3y-5y	8.5% FEB-20	30	59	-4.4	8.7	8.75% MAY-20	30	58	1.3	1.9	5.7	2.5	3.2	1.1	-6.7	-3.9	-2.8	-1.1
30s	5y-10y	6.25% AUG-23	30	49	-2.7	-8.0	8.125% MAY-21	30	55	0.2	-2.2	3.0	5.0	-2.0	-0.9	5.8	-0.5	6.3	2.4
30s	10y-30y	4.75% FEB-37	30	32	-7.8	-18.8	5.5% AUG-28	30	39	4.4	-13.7	12.2	4.5	7.8	1.4	5.1	5.1	0.0	0.0

*Yield error and maturity matched spread differential stats for selected pairs in various maturity buckets. The selection is based on max/min yield error segregated by original issue sector.

Notes: Old refers to the number of newer issues in that original maturity series: OTR=0, Olds=1, double olds=2, etc. The 1Y avg, residual and z-score are estimated rolling to the equivalently old issues.
R/C is the difference between the current and 1Y Average

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"Other Disclosures" last revised April 09, 2016.